The Northeast – Southeast – Midwest Corridor Marketing Study

EXAMINING THE POTENTIAL TO DIVERT HIGHWAY TRAFFIC FROM INTERSTATE 81 TO RAIL INTERMODAL MOVEMENT

Part II – Report Appendices

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APPENDIX 1

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Review of Highway Traffic Volumes

1. Background

Traditionally, most state transportation planning agencies, DOTs and MPOs have focused their infrastructure planning on highways and given less attention to other modes for possible investment, for the fundamental reason that they control investment in highways. However, there is a growing recognition that (a) more multi-modal public planning is needed for freight movement, (b) that such planning should include rail, air and water as well as highway options for freight movement, and (c) that freight planning, if done well, can help address a wide range of issues relating to industrial development, cargo security, highway congestion, transportation safety and air quality. For this integration of multi-modal planning to be accomplished, however, transportation planning agencies will need to identify key transportation planning issues and players, and to develop possible solutions to the problems of the present and the opportunities for the future.

The foundation of this Market Study is an overview of the current freight market environment. This data provides the origins and destinations of freight in Virginia, the quantity and commodity mix of that traffic, and the distribution of traffic between and within modes. The freight traffic data used in this report has been assembled using Reebie Associates' Year 1998 TRANSEARCH® database, adjusted for growth to reflect 2001 volumes.

2. Freight Flows & Modal Distributions

Freight activity is comprised of local, regional and interregional movements. For this analysis, we focused on regional and interregional freight activity. There are other kinds of freight movement that this study does not directly address. Several examples are home delivery from retail establishments, building and equipment maintenance, lawn and grounds care, and insect control.

The purpose of analyzing freight flow data is to establish the basic characteristics of freight demand, its future and potential to shift, and its performance requirements. The data assembled for this analysis represents current freight volumes for the Commonwealth and surrounding regions. These data can be used by Virginia to:

- Locate infrastructure demand conflicts and economic development opportunities;
- Identify operational planning and cross-modal synchronization opportunities for the region;

- Determine the degree of jurisdictional coordination and control required to balance these demands.

For purposes of this analysis, we separated truck and rail freight traffic into three distinct buckets. These buckets were structured to address specific questions about the viability of transportation infrastructure investment and were maintained throughout the analysis. These segments are represented by the following:

Inbound Traffic – Traffic moving domestically FROM regions across the nation INTO specified counties in Virginia. The structure for this data is defined as a Business Economic Area (BEA) region as the origin, and a Virginia County [reported as a Federal Information Processing Standard (FIPS) code] as the destination. Volumes are reported in tons, for all truck modes [Truckload, Less-than-Truckload, and Private Truck]. The results of the inbound traffic analysis help to determine the size of the available local market, the depth and fit of the industrial sectors served by this freight transport activity, and the measure of growth or decline in freight activity – a measure of real transportation activity, and a proxy measure for industrial DEMAND.

Outbound Traffic – Traffic moving domestically TO regions across the nation FROM specified counties in Virginia. The structure for this data is defined as a Virginia County [reported as a Federal Information Processing Standard (FIPS) code] as the origin, and a Business Economic Area (BEA) region as the destination. Volumes are reported in tons, for all truck modes [Truckload, Less-than-Truckload, and Private Truck]. The results of the outbound traffic analysis help to determine the degree of "balance" available in the local market, the fit of the commodities shipped relative to the equipment made empty in the region, and the measure of growth or decline in freight activity – a measure of real transportation activity, and a proxy measure for industrial OUTPUT.

Through Traffic – Interregional traffic flows that move through the State without in-state processing, storage, or handling. Through traffic is that freight which consumes capacity on the regional infrastructure, but which does not generally provide local manufacturing employment. The structure for this data is defined as a Business Economic Area (BEA) as the origin, and a Business Economic Area (BEA) as the destination. Volumes are reported in tons, for all truck modes [Truckload, Less-than-Truckload, and Private Truck]. The results of the through traffic analysis help identify opportunities for commercial development and areas of excessive infrastructure demand. Through traffic is additive to inbound or outbound flows, depending on the direction of travel, and serves as a proxy measure for national economic activity.

Virginia's total traffic base is skewed heavily towards through traffic as opposed to originating or terminating. By virtue of the extensive grid of Interstate Highways in the

State, and the terrain of the region, traffic flows from Miami, FL to Portland, ME or New York, NY to Mexico City, MX traverse the arteries of Virginia.

Also of interest is the relative balance of local traffic in the state. Indeed the inbound and outbound tonnage volumes are within fifteen percent of each other. This suggests that overall logistics costs in Virginia would be lower than average and that headhaul and backhaul truck rates approach parity.

Figure A1.1 outlines the distribution of traffic moving in the State, and portrays the sizable volume of through traffic relative to the balanced local volumes.

3. Situation in the Corridor

Truck traffic on Interstate 81 through Virginia is expected to grow by 90%[1] between 1998 and 2020. The Commonwealth is expecting to make significant investments to accommodate this traffic. However, there is reluctance to keep widening the highway if there are more cost effective, as well as environmentally friendly, alternatives. The General Assembly (through House Joint Resolution 704 and Senate Joint Resolution 55) has asked that alternative investments in intermodal facilities be investigated.

1 FHWA Freight Analysis Framework

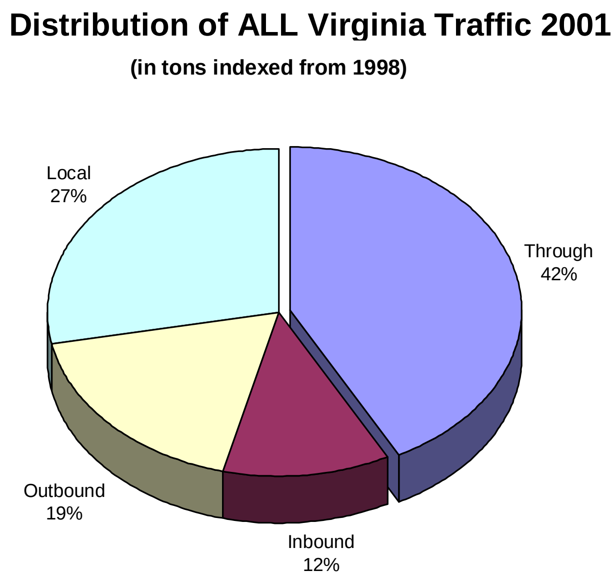


Figure A1. 1

The primary mode for the movement of goods and services in the study corridors is truck. Vehicles range from long tractor-trailers hauling food from warehouses to high-volume grocers, to smaller, heavily laden dump trucks en-route to job sites, to light route trucks and step vans making twenty-five stops in a thirty-mile business pocket. They operate according to the schedules of their clientele, some in the late night and early morning, others throughout the workday. In almost all cases, they are striving to use time with a high degree of efficiency, and are balancing congestion, circuitry, speed postings, toll costs, facility access, and other factors to achieve this. These trucks are the immediate conduits by which goods and services are supplied and distributed in the Virginia economy, supporting the indigenous population, businesses, institutions, and government.

Historically, intermodal transportation has not been a strong competitor in flows between the U. S. North and Southeast. A number of factors have contributed to this. Major Northeastern rail carriers primarily served east-west routes, and found it more profitable to use limited resources for those routes where their longer haul, coupled with greater densities- provided the highest efficiencies. The relatively un-congested north-south freeways offered greater access to competing trucks than the toll roads paralleling the east-west flows. For example, between Chicago, IL and New York, NY the intermodal share of the combined total truck and intermodal market is 25%, while for the similar distance Harrisburg, PA to Atlanta, GA lane, intermodal only gets 5.3% of the volume.[2]

Thus, there is an implication that I-81 is an under-served market for intermodal services. With the acquisition of Conrail by Norfolk Southern and CSX, there is now a greater potential to profitably serve this market. At the same time, increasing congestion, longer hauls (including a strong growth in international traffic), as well as market concentration may also push logistics choice towards intermodal. As the accompanying map makes plain[3], there are significant long-haul truck volumes using I-81 and its feeders.

The majority of this volume represents Dry-Van freight -- the type of traffic that is most competitive for intermodal transport. But the railroads operating in this region have admitted that their current intermodal service offerings have been unable to divert substantial volumes of highway freight. They are continuing to analyze what technologies and services will prove most attractive to the largest of the highway markets: trailer movements.

The current Northeast – Southeast – Midwest Corridor Marketing Study seeks to determine the marketplace demand for improved intermodal services, and the degree to which such services can divert highway traffic from these congested corridors.

3.1.1 Current Traffic Flows

Using TRANSEARCH data, we explored traffic moving along the segments representing the major highway corridors in Virginia. To do this, we queried the TRANSEARCH data using the Oak Ridge National Laboratory's (ORNL) highway routing model.

In 2001, Virginia's I-81 Corridor served as the gateway for over 2 million loads of freight. This represents approximately 0.05% of the total national truck freight. Over 42% of the total traffic (tons) is through-traffic, neither originating nor terminating in Virginia. The 2001 I-81Corridor freight traffic is summarized in Figure A1.5 and is shown on the highway network in Figure A1.2.

2 BEA to BEA Flows, 2001 TRANSEARCH

3 Domestic flows of 500 miles or more, using some of Interstate 81 in Virginia, routes with 1 million net tons annually or more, 2000 TRANSEARCH

Figure A1.2

Distribution of All Virginia Highway Traffic for 2001 (indexed from 1998)

Direction	Net Tons	Loads	Share of Tons	Share of Loads
Inbound	46,706,967	2,181,137	12%	12%
Outbound	72,631,711	3,371,287	19%	19%
Local	103,226,134	5,161,745	27%	29%
Through	158,834,286	7,126,188	42%	40%
Total	381,399,098	17,840,357	100%	100%

Figure A1.3

Much of the focus of the current analysis is the substantial volume of through traffic on the Commonwealth's major arteries.

Figure A1.4 outlines the distribution of this "through" traffic by major commodity groupings. The diverse composition of this traffic suggests that traditional rail intermodal services will have only limited success in penetrating the market. Substantial volumes of bulk liquid, bulk solid and flatbed traffic moving through the state necessitate an analysis of unconventional intermodal products in an effort to increase the market base of traffic available for modal diversion.

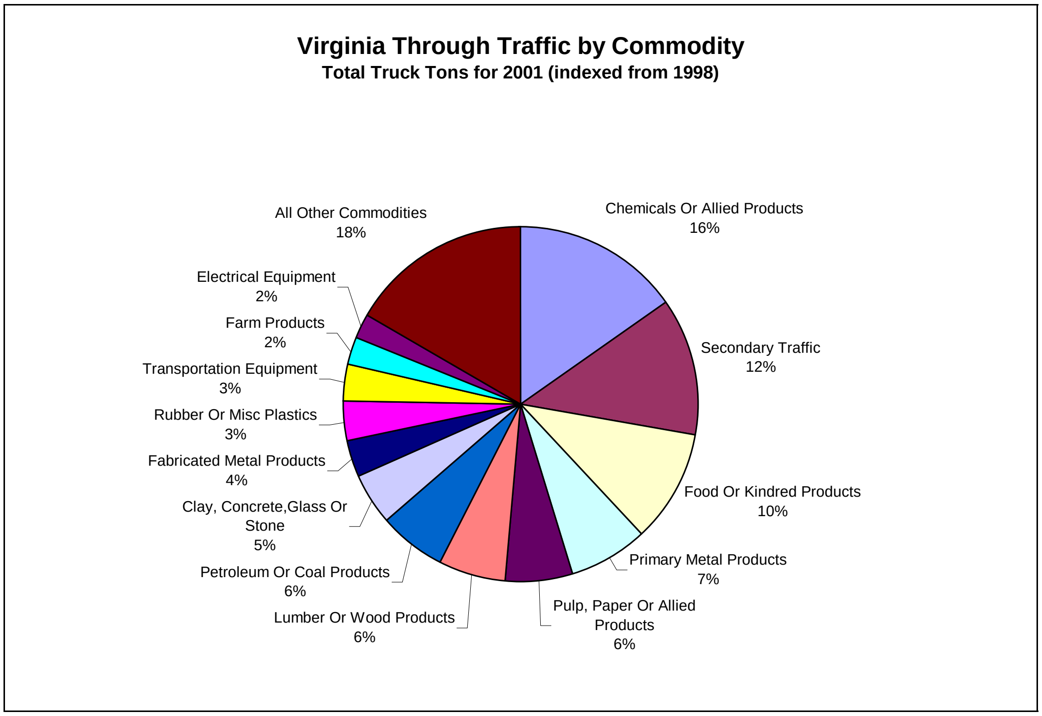


Figure A1.4

*3.1.2 **Primary Traffic Lanes***

The primary origin and destinations of I-81Corridor traffic are displayed in Figure A1.5.

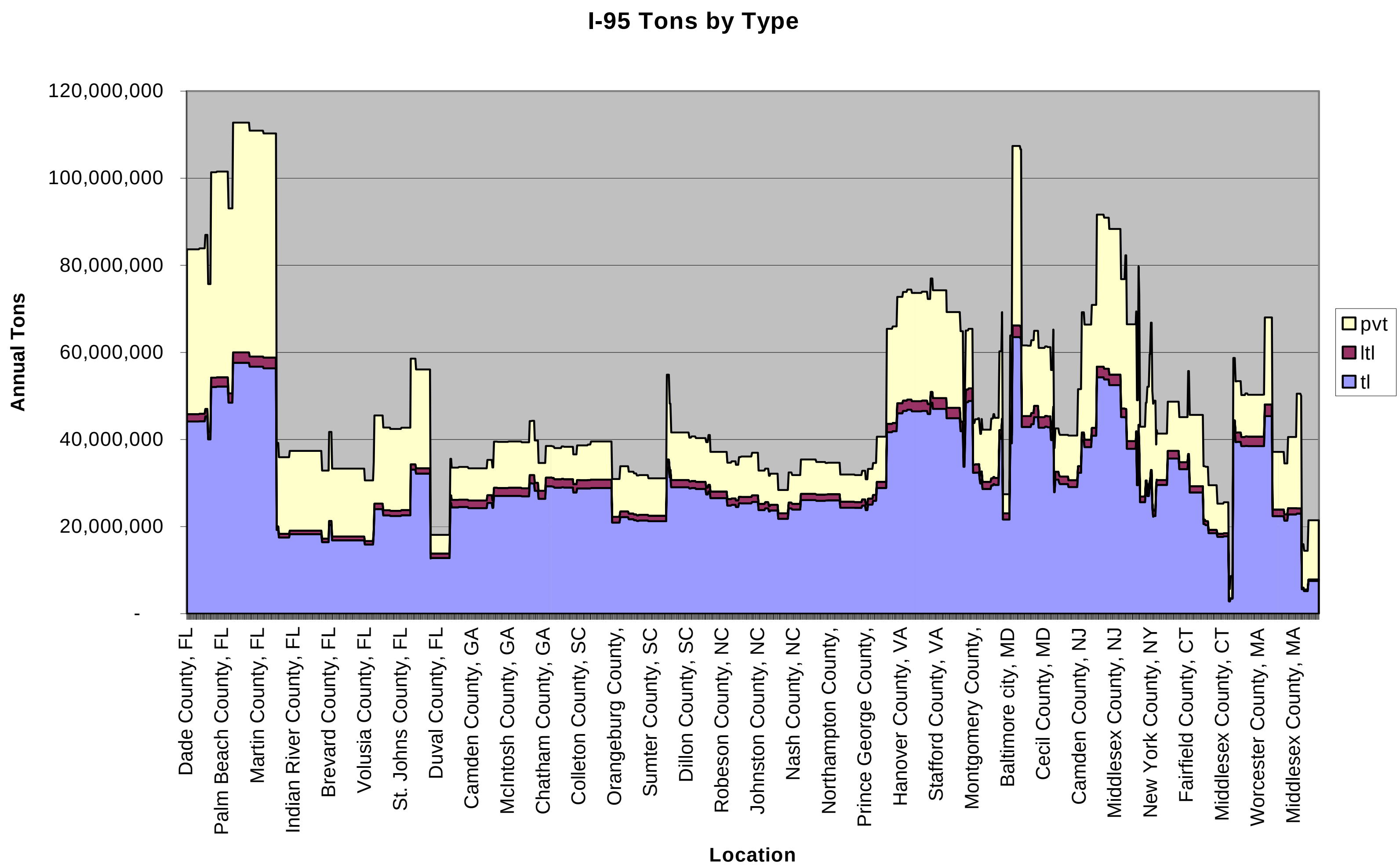
2001 Highest Volume Lanes – I-81 Traffic				
Origin	Destination	Annual Tons	Annual Loads	Cum. Pct of Loads
Roanoke, VA	Washington, DC	5,042,870	271,483	4.1%
Staunton, VA	Washington, DC	3,422,994	161,582	6.5%
New Orleans, LA	New York, NY	3,347,024	142,107	8.7%
Washington, DC	Roanoke, VA	2,727,023	136,422	10.7%
Houston, TX	New York, NY	2,724,352	120,586	12.6%

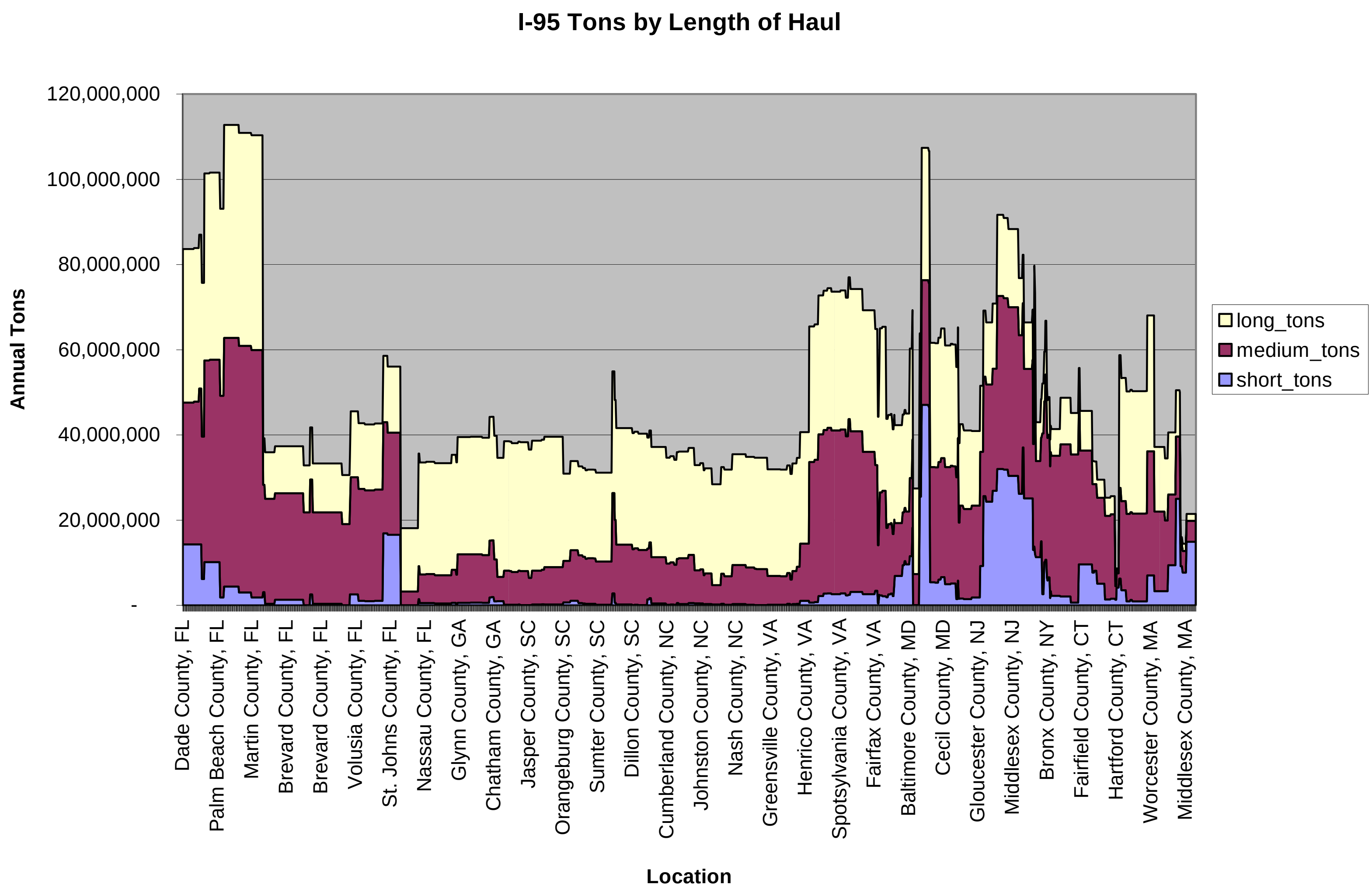
2001 Highest Volume Lanes – I-81 Traffic				
Origin	Destination	Annual Tons	Annual Loads	Cum. Pct of Loads
Baton Rouge, LA	New York, NY	2,659,193	115,358	14.3%
Los Angeles, CA	Staunton, VA	2,270,582	136,975	16.4%
Houston, TX	Philadelphia, PA	1,965,971	91,967	17.8%
Lexington, KY	Richmond, VA	1,878,710	77,381	18.9%
Roanoke, VA	Norfolk, VA	1,757,870	99,740	20.4%
Johnson, City, TN	Washington, DC	1,706,521	87,239	21.7%
Roanoke, VA	Richmond, VA	1,604,803	88,676	23.1%
Atlanta, GA	New York, NY	1,575,816	72,796	24.2%
Norfolk, VA	Roanoke, VA	1,507,132	78,506	25.4%
Lexington, KY	Norfolk, VA	1,409,772	61,421	26.3%
Dallas, TX	New York, NY	1,386,619	64,434	27.3%
New York, NY	Atlanta, GA	1,193,306	53,155	28.1%
Houston, TX	Boston, MA	1,135,683	48,646	28.8%
Washington, DC	Staunton, VA	1,113,939	53,964	29.6%
Richmond, VA	Roanoke, VA	1,085,264	51,290	30.4%
Total		**41,515,445**	**2,013,728**	

Figure A1.5

4. Characteristics of Highway Freight

The attached charts show the freight traffic on Interstate 81 from the Ontario border to the intersection with Interstate 40 in Tennessee, and Interstate 95 from Miami, Florida to the Boston, MA suburbs. They are based on TRANSEARCH data, flowed over the Oak Ridge Network. Type are truckload (TL), less-than-truckload (LTL) and private truck (PVT). Length of haul is divided into hauls under 100 miles (short_tons), hauls between 100 and 500 miles (medium_tons), and hauls over 500 miles (long_tons).


I-95 Tons by Type
Annual Tons
120,000,000
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
-
pvt
ltl
tl
Dade County, FL
Palm Beach County, FL
Martin County, FL
Indian River County, FL
Brevard County, FL
Volusia County, FL
St. Johns County, FL
Duval County, FL
Camden County, GA
McIntosh County, GA
Chatham County, GA
Colleton County, SC
Orangeburg County,
Sumter County, SC
Dillon County, SC
Robeson County, NC
Johnston County, NC
Nash County, NC
Northampton County,
Prince George County,
Hanover County, VA
Stafford County, VA
Montgomery County,
Baltimore city, MD
Cecil County, MD
Camden County, NJ
Middlesex County, NJ
New York County, NY
Fairfield County, CT
Middlesex County, CT
Worcester County, MA
Middlesex County, MA
Location


I-95 Tons by Length of Haul
120,000,000
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
-
Annual Tons
long_tons
medium_tons
short_tons
Dade County, FL
Palm Beach County, FL
Martin County, FL
Brevard County, FL
Brevard County, FL
Volusia County, FL
St. Johns County, FL
Nassau County, FL
Glynn County, GA
Chatham County, GA
Jasper County, SC
Orangeburg County, SC
Sumter County, SC
Dillon County, SC
Cumberland County, NC
Johnston County, NC
Nash County, NC
Greensville County, VA
Henrico County, VA
Spotsylvania County, VA
Fairfax County, VA
Baltimore County, MD
Cecil County, MD
Gloucester County, NJ
Middlesex County, NJ
Bronx County, NY
Fairfield County, CT
Hartford County, CT
Worcester County, MA
Middlesex County, MA
Location

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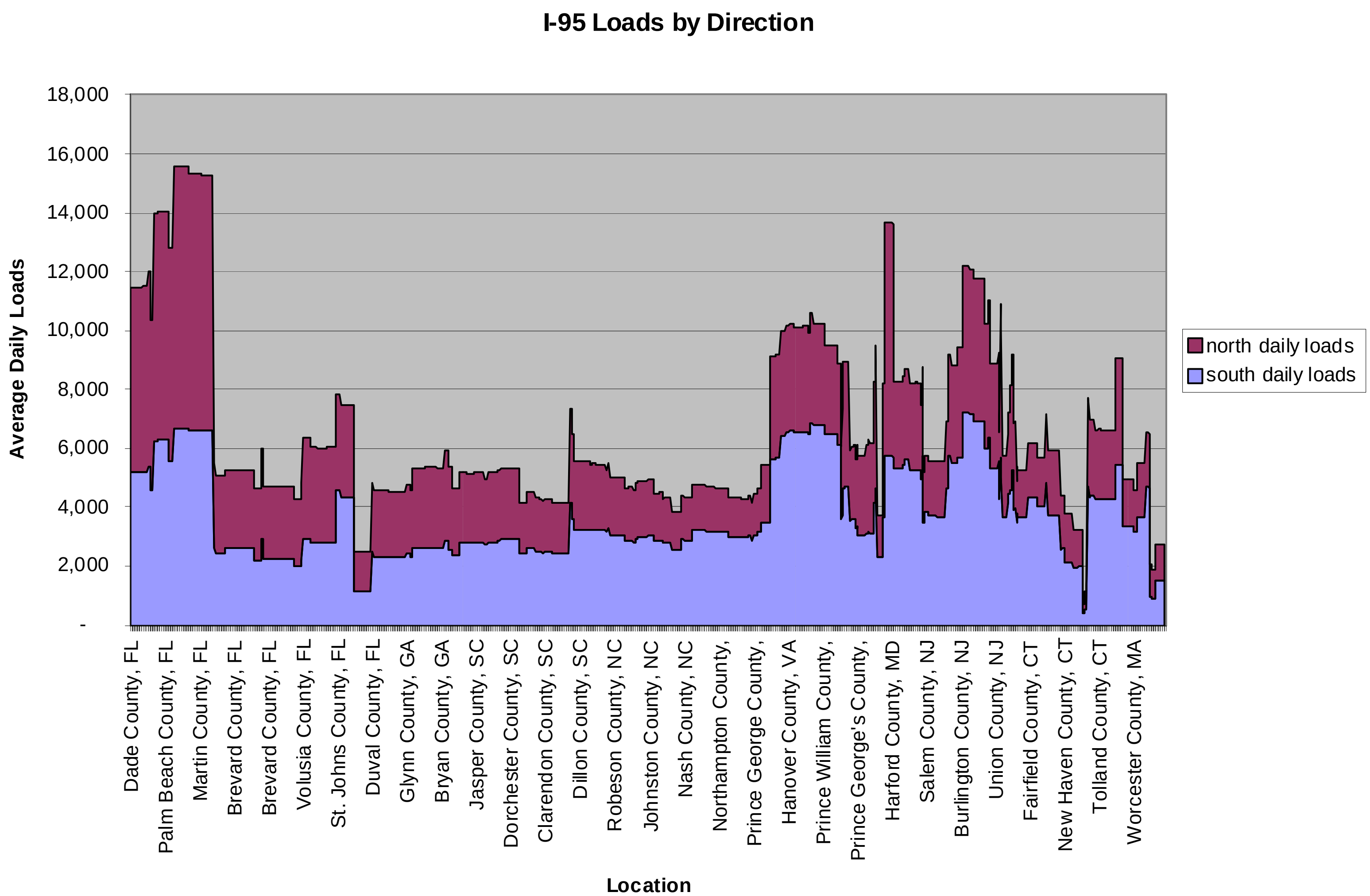
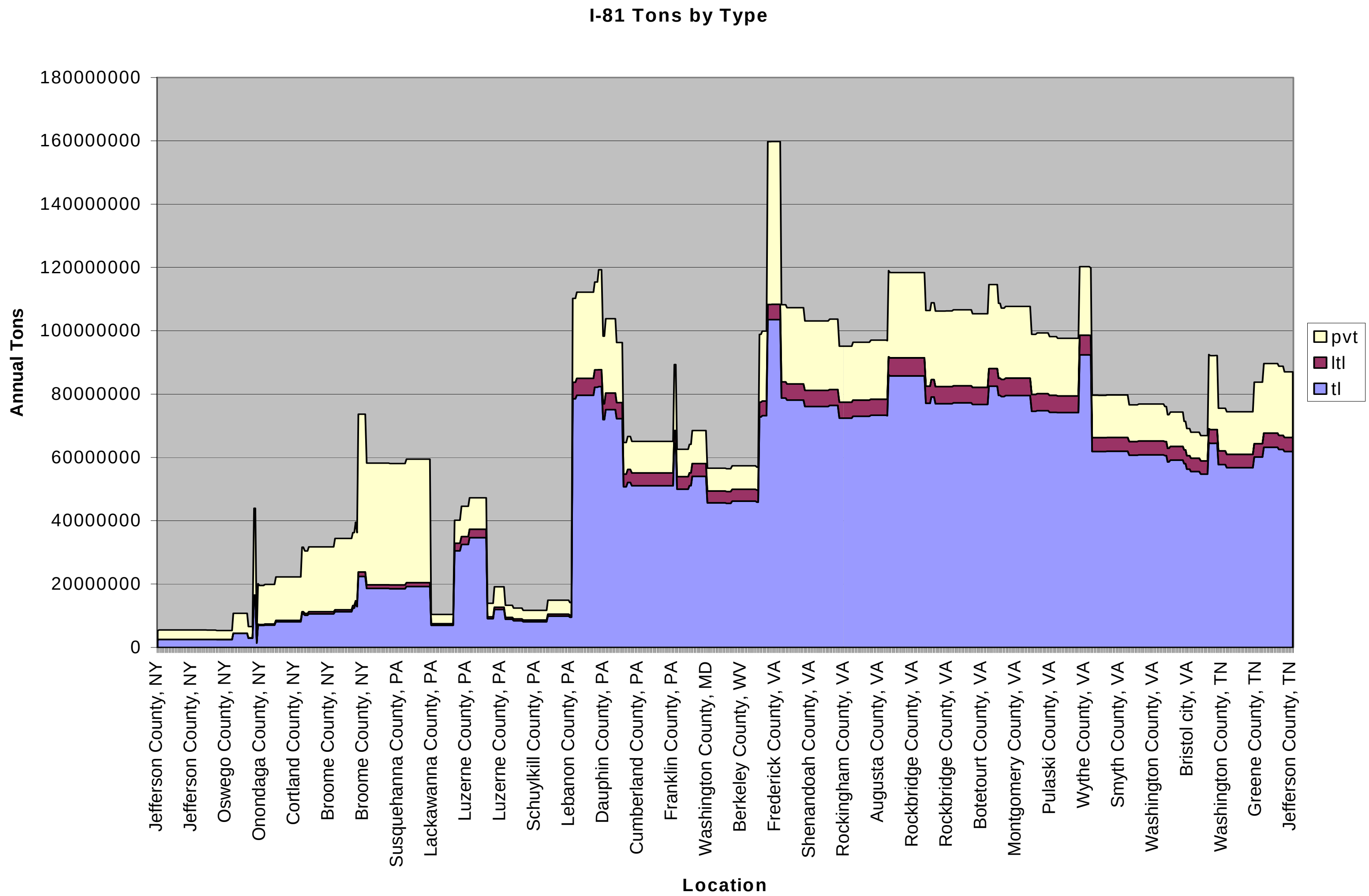
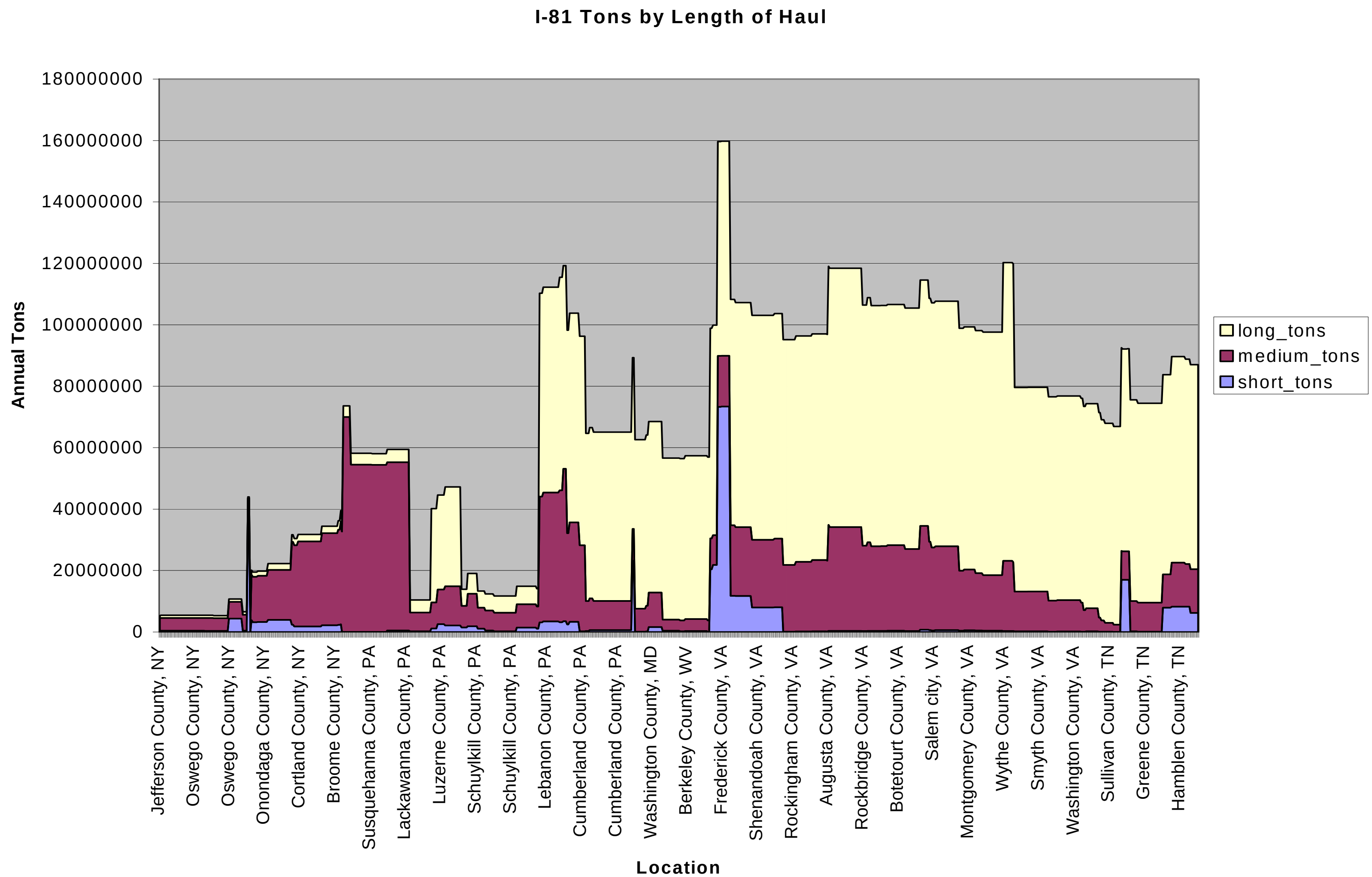
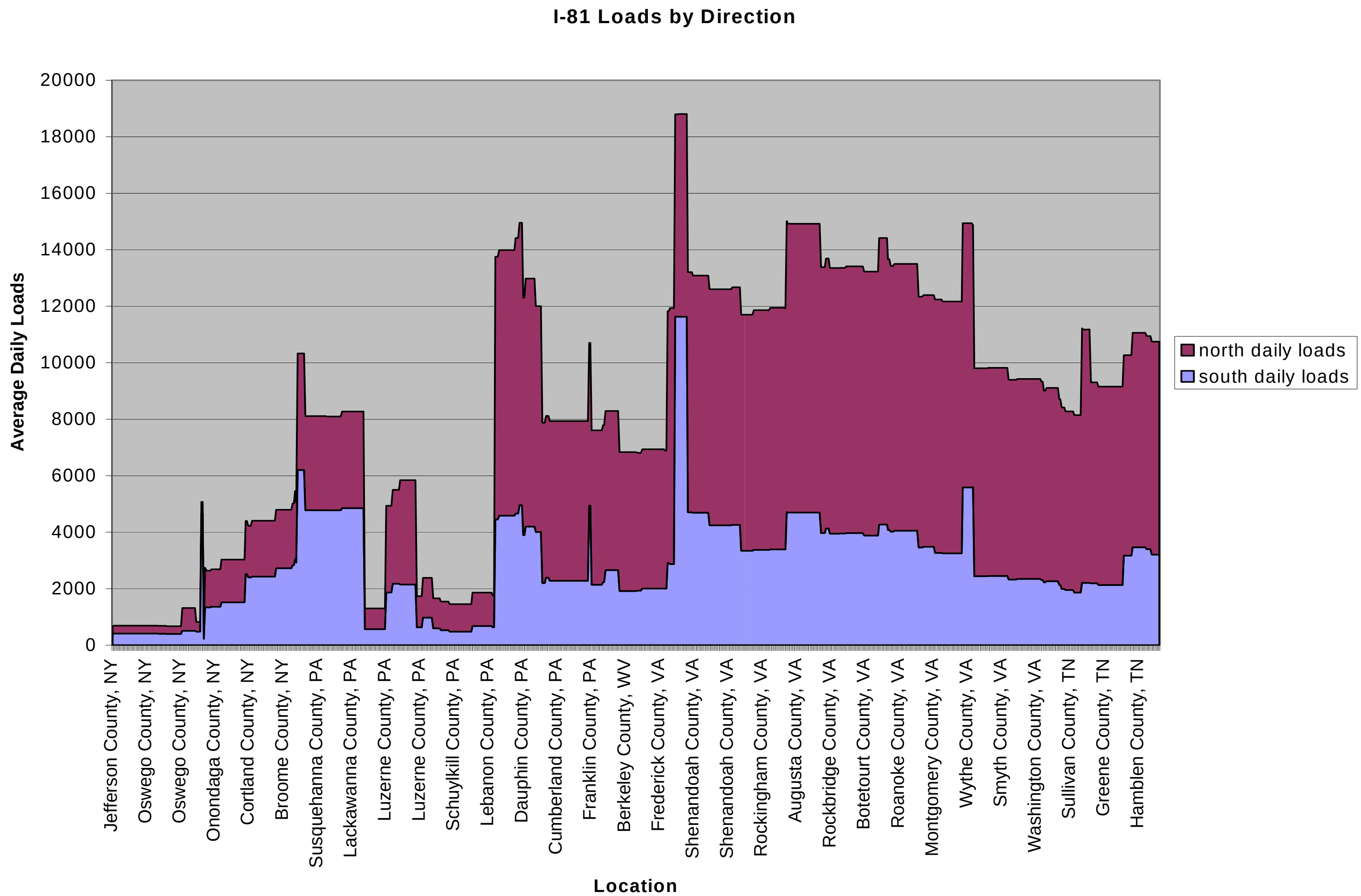

I-95 Loads by Direction
Average Daily Loads
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
-
north daily loads
south daily loads
Dade County, FL
Palm Beach County, FL
Martin County, FL
Brevard County, FL
Brevard County, FL
Volusia County, FL
St. Johns County, FL
Duval County, FL
Glynn County, GA
Bryan County, GA
Jasper County, SC
Dorchester County, SC
Clarendon County, SC
Dillon County, SC
Robeson County, NC
Johnston County, NC
Nash County, NC
Northampton County,
Prince George County,
Hanover County, VA
Prince William County,
Prince George's County,
Harford County, MD
Salem County, NJ
Burlington County, NJ
Union County, NJ
Fairfield County, CT
New Haven County, CT
Tolland County, CT
Worcester County, MA
Location


I-81 Tons by Type
Annual Tons
180000000
160000000
140000000
120000000
100000000
80000000
60000000
40000000
20000000
0
pvt
ltl
tl
Jefferson County, NY
Jefferson County, NY
Oswego County, NY
Onondaga County, NY
Cortland County, NY
Broome County, NY
Broome County, NY
Susquehanna County, PA
Lackawanna County, PA
Luzerne County, PA
Luzerne County, PA
Schuylkill County, PA
Lebanon County, PA
Dauphin County, PA
Cumberland County, PA
Franklin County, PA
Washington County, MD
Berkeley County, WV
Frederick County, VA
Shenandoah County, VA
Rockingham County, VA
Augusta County, VA
Rockbridge County, VA
Rockbridge County, VA
Botetourt County, VA
Montgomery County, VA
Pulaski County, VA
Wythe County, VA
Smyth County, VA
Washington County, VA
Bristol city, VA
Washington County, TN
Greene County, TN
Jefferson County, TN
Location


I-81 Tons by Length of Haul
Annual Tons
180000000
160000000
140000000
120000000
100000000
80000000
60000000
40000000
20000000
0
long_tons
medium_tons
short_tons
Jefferson County, NY
Oswego County, NY
Oswego County, NY
Onondaga County, NY
Cortland County, NY
Broome County, NY
Susquehanna County, PA
Lackawanna County, PA
Luzerne County, PA
Schuylkill County, PA
Schuylkill County, PA
Lebanon County, PA
Cumberland County, PA
Cumberland County, PA
Washington County, MD
Berkeley County, WV
Frederick County, VA
Shenandoah County, VA
Rockingham County, VA
Augusta County, VA
Rockbridge County, VA
Botetourt County, VA
Salem city, VA
Montgomery County, VA
Wythe County, VA
Smyth County, VA
Washington County, VA
Sullivan County, TN
Greene County, TN
Hamblen County, TN
Location


I-81 Loads by Direction
Average Daily Loads
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
north daily loads
south daily loads
Jefferson County, NY
Oswego County, NY
Oswego County, NY
Onondaga County, NY
Cortland County, NY
Broome County, NY
Susquehanna County, PA
Lackawanna County, PA
Luzerne County, PA
Luzerne County, PA
Schuylkill County, PA
Lebanon County, PA
Dauphin County, PA
Cumberland County, PA
Franklin County, PA
Berkeley County, WV
Frederick County, VA
Shenandoah County, VA
Shenandoah County, VA
Rockingham County, VA
Augusta County, VA
Rockbridge County, VA
Botetourt County, VA
Roanoke County, VA
Montgomery County, VA
Wythe County, VA
Smyth County, VA
Washington County, VA
Sullivan County, TN
Greene County, TN
Hamblen County, TN
Location

The Northeast – Southeast – Midwest Corridor Marketing Study

Appendix 2

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Review of Prior Studies

1. Background

To date, there have been two Commonwealth-sponsored studies to analyze the relationship between highway traffic and rail intermodal in Virginia. These are the Virginia Intermodal Feasibility Study conducted by Parsons Brinkerhoff, and the SJR-55 Study conducted by Wilbur Smith Associates (WSA) and Norfolk Southern Corporation (NS). In addition, other studies have analyzed regional issues that pertain to the current project. Among these is the Tennessee Study. The collective analysis contained in these studies suggests that the opportunity to divert long-haul truck traffic to rail intermodal would provide significant positive benefits to the Commonwealth. However, such a diversion could not be accomplished without substantial and costly upgrades to the parallel rail infrastructure.

From these studies two questions remain; (1) is there a marketplace demand for improved intermodal service in the corridor, and (2) what type of service offering will generate the greatest diversion benefit to the corridor? These questions represent the focus of the current Northeast – Southeast – Midwest Corridor Marketing Study.

1.1 House Resolution-704

The recent concentrated study of intermodal issues in Virginia springs from a Commonwealth of Virginia House Resolution 704 (HR-704), which sought to analyze rail alternatives to the increasing highway congestion on long-haul interstates. This resolution requested the Virginia Department of Transportation (VDOT) and the Virginia Department of Rail and Public Transportation (VDRPT) sponsor an analysis of rail intermodal facilities in the Commonwealth, and the regional demand for expanded intermodal capacity.

This first study commissioned by VDRPT and VDOT was executed by Parsons Brinkerhoff in June 2000, and identified all existing rail intermodal facilities in Virginia. This study also reported the volume of activity for each of these facilities, and an estimate of construction costs for new rail intermodal facilities. Using 1996 traffic data from Reebie Associates, and an algorithm-based routing model, the Parsons team analyzed freight traffic on Virginia's Interstates, and suggested that I-81 captures 52% of the long-haul truck movements moving through the State. Virginia's I-64 handles 35% of the Commonwealth's long haul traffic, while I-95 – predominantly a corridor for shorter-haul freight – handles 13%.

The Parsons analysis identified the following long-haul origin-destination pairs as having the highest volumes of traffic in the Commonwealth:

- Atlanta and New York and beyond to Boston
- Atlanta and the Philadelphia – Baltimore -- Washington DC
- New York and Miami
- New Orleans and New York
- Charlotte and Winston-Salem to New York

The results of the Parsons study were presented to the Virginia House of Representatives in House Document No. 23 – Desirability and Feasibility of Establishing Additional "Intermodal Transfer Facilities"; and concluded no new terminals were justified, but that the Commonwealth should encourage the development and expansion of intermodal services -- *including funding such expansion if necessary*. In addition, the study recommended a more thorough analysis of the potential for rail intermodal services to divert highway business.

1.2 Senate Joint Resolution-55

The follow-on analysis to the HR-704 study was sponsored through the Senate Joint Resolution 55 (SJR-55). This resolution sought to build upon the results of the Parsons study by evaluating "the potential for shifting Virginia's highway traffic to railroads."[4] VDOT and VDRPT selected Wilbur Smith Associates to conduct this next analysis, focusing particular attention on the long-haul freight moving in the I-81 Corridor.

This study utilized an updated[5] (1998) database of freight flows and a series of Federally designed analysis tools to estimate the possible shift of highway traffic to an improved intermodal service product in the corridor.

This study contemplated two independent analyses, one conducted by the Wilbur Smith team, and the other by Norfolk Southern – the beneficial owner of a parallel rail route.

[4] SJR-55 Resolution as quoted in Senate Document 30.

[5] Updated to include data from LATTS (The Latin American Trade and Transportation Study conducted by Wilbur Smith Associated in 1999)

The study employed the HERS[6] methodology to estimate benefits of $300 M - $1B to be derived from a modal shift of freight consistent with the diversion analyses.

1.2.1 ***Potential for Diversions***

The Wilbur Smith study suggested that modal diversions to an improved intermodal product might be between 10% and 25% of the long-haul freight traffic in the I-81 Corridor. The NS Study concluded that between 2% and 27% of the long-haul freight might be diverted to an improved intermodal product. Both analyses suggested, however, that additional market data and analysis would be required to validate the accuracy of these estimates.

1.2.2 ***Capital Improvements required for Rail Corridor***

The studies also analyzed the cost of improvements to the railroad infrastructure that might be required to provide a truck-competitive service in the corridor. These analyses concluded that approximately $2.3 B would be required to add capacity to the NS Shenandoah line. This amount included approximately $1.2 B in Virginia improvements alone. The studies suggested that an alternative routing via NS's Piedmont Line might be more cost effective, and should be the subject of an additional study.

1.2.3 ***Recommendations from SJR-55***

The study concluded that the direct benefits of modal shift on the I-81 corridor were significant, and included a reduction in highway user costs, highway safety costs, pavement maintenance costs, and an improvement in air quality. The report suggested however, that the selected rail route alternative (Shenandoah Line) was an expensive and impractical approach to achieving the desired benefits.

The study also suggested that two follow-on studies be commissioned. The first should seek to refine the market areas and latent demand for the improved intermodal service. The second recommended study should perform a more detailed analysis of potential railway operating speeds, line capacities and schedule improvements associated with an improved service for the corridor.

The results of the Wilbur Smith study were reported to the Legislature in Senate Document No. 30 – The Potential for Shifting Virginia's Highway Traffic to Railroads. Acting on the recommendation of the SJR-55 analysis, the Commonwealth secured the

[6] HERS – Highway Economic Requirement Systems

necessary federal funding, and commissioned this follow-on study to analyze the marketplace demand for an improved intermodal service product, and conduct a detailed analysis of the investments required to make the forecasted modal shifts a reality.

1.3 Conclusions

Former Secretary of Transportation Shirley J. Ybarra, in her letter to former Governor James S. Gilmore in December 2000, cites that there are four reasons to revisit the previous I-81 Corridor analyses. These reasons include the following:

- Continuing business activity by Norfolk Southern or CSX
- Technological innovations in intermodal transportation
- A substantial change in economic behavior, or
- A change in federal or state legislative or regulatory policy

With the integration of Conrail by Norfolk Southern and CSXT complete and with service levels returning to pre-merger levels, the eastern carriers are again focusing attention on the issues of North-South markets. In addition, the recent MAROPS analysis suggests that there is a building consensus on the need to expand eastern rail corridor capacities. Finally, the inability of rail carriers to expand domestic containerization has prompted a second look at innovative rail intermodal technologies as represented by Triple Crown's RoadRailer Service, and Canadian Pacific's Expressway product.

These factors corroborate the Commonwealth's decision to revisit its I-81 analyses, and to assess the market receptivity to the proposed modal diversion initiatives.

THE NORTHEAST – SOUTHEAST – MIDWEST CORRIDOR MARKETING STUDY

APPENDIX 3

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Motor Carrier Analysis

1. Background

To better understand the process and results of the motor carrier survey it is appropriate to offer some background information about the trucking industry in general and as it relates to the I-81 corridor. Trucking companies are divided into four basic types, truckload "for hire", private fleets operated by shippers, less-than-truckload (LTL), and package carriers. Examples in each category would be the fleets operated by J. B. Hunt, the Wal-Mart private fleet, Yellow Freight, and United Parcel Service. These carriers represent some of the largest of their type. There are many more small players in each category that transport the bulk of the freight in the country.

Carriers can operate in a nationwide market or they can focus their efforts on a regional or even a local area. There is a great deal of diversity in size, sophistication, and philosophy of operation.

Recent operating conditions for truckers have been very difficult. Rising fuel and insurance prices and other economic factors have forced many carriers, both large and small, from the market. This reduction in fleet capacity has put additional pressure on both shippers and carriers. Most people in the transportation community believe that any improvement in the economy will result in serious shortages of capacity to move freight throughout the country. Additionally, highway congestion in certain areas has complicated and slowed service to an extent that additional pressure is exerted on capacity. For many carriers, intermodal services become an attractive alternative in markets where they meet the economic and service requirements of the shippers. An intermodal offering can allow a carrier to significantly expand their capacity for service when certain criteria are met. When considering an intermodal option a carrier must weigh the various criteria related to their size and type of operation before determining that the services will be beneficial.

Some carriers choose not to use intermodal service as a way of differentiating themselves in the market. They believe they have appeal to shippers that have experienced problems with intermodal service in the past.

Size may be the factor that limits or excludes a carrier's use of intermodal service. A certain level of infrastructure is required to manage a traditional intermodal shipment. Connections at both ends of the shipment are necessary to arrange the dray movement to the railhead as well as the connections to manage the pricing and scheduling for the rail portion of the movement. For very small carriers this type of knowledge and the necessary infrastructure are beyond their capabilities and so most do not even consider intermodal options.

In order to move a shipment via rail, the carrier must have access to the appropriate equipment. If their own equipment is to be used, it must be structurally suitable and they must have enough extra to allow for continuing operation during the time that the trailer is on the rail. Carriers operating consistently in an intermodal market with their own equipment carry a larger trailer to tractor ratio than those that do not. This additional expense may keep some carriers out of the intermodal market. The choice to use rail owned equipment may be available but again, the internal infrastructure must be present to take advantage of that option.

Equipment type and balance play a large role in a company's intermodal decisions. Motor carriers use a combination of equipment including spring-ride trailers, air ride trailers, and intermodal containers. To be used for intermodal service a trailer must be equipped to withstand the vertical lift on to the rail car. In general, a spring-ride, lift bed trailer is required for intermodal operation. Some equipment is reinforced to allow top lifting. If a fleet has standardized with the type of trailer that can be lifted, then any load can be moved by truck or as an intermodal shipment. For these carriers, the choice of mode becomes independent of the equipment. For fleets that have mixed equipment composition, spring-ride, air-ride, and/or containers, the mode choice is not independent. The carrier must be sure that the empty box for the load supports the choice of loaded movement mode.

When equipment type enters the decision making process, then balance becomes important. Given a limited number of assets, the carrier needs to be concerned with keeping those assets in areas where they can continue to move and not be idled by the lack of appropriate loads. In the case of the I-81 market, the Northeast is heavily consumer based and there is much more inbound traffic from the south than outbound. For a carrier working to balance traffic, the outbound flow from the Northeast becomes the limiting factor.

Some carriers move their equipment in a three-step process known as triangulation. The general flow is from the Southeast to the Northeast to the Midwest and back to the Southeast. If a carrier does not control intermodal eligible freight in all three of the lanes then the lane with the smallest intermodal potential becomes the limiting factor

Carriers with regional operations, including many private fleets, are not currently considering intermodal services as they more traditionally fit a longer haul market. New short haul intermodal offerings would be necessary to attract this regional group and some percentage of the nationwide private fleet carriers.

2. Market Segmentation

The discussion above points out the ways that access to equipment, infrastructure, and knowledge may impact a carrier's ability to utilize rail service as part of its operation. This market segmentation, clearly an issue of carrier size, influences the potential for rail diversion. During the course of this investigation it became clear that the market segmentation among the carriers was an issue of great significance. In order to understand the intermodal diversion potential, it is necessary to understand the operational characteristics and behavior of carriers in each segment. What follows is a description of four size groupings that the study team found to be representative of the carriers operating throughout the country and more importantly, through the state of Virginia.

2.1 Super Carrier

In the motor carrier industry there are a handful of carriers that can be categorized as super in each of the groups, truckload, LTL, and package providers. The fleet strength for these carriers is greater than three thousand operating units with trailers or containers numbering in the ten to twenty thousand range. These fleets are nationwide in scope, operating with company equipment and independent owner operators under exclusive lease. Their operations include large logistics entities that act as third party providers in the market. They are heavily dependent on technology and have the most highly developed systems, tracking, and operational processes. They often use other carriers to substitute service for their clients. The bulk of these super carriers have extensive intermodal operations that have consumed a large portion of the long haul intermodal traffic in the country.

The support staff in these carriers is large, extensively trained, and savvy regarding all possible methods of moving freight in the most cost effective and service oriented fashion.

The customer base is predominantly Fortune 500 and their capacity is committed by extensive multi-year contracts. There is one carrier in this group whose strategy is to sell through independent agents and focus on freight in smaller, more diverse markets. Nevertheless, its operations and use of intermodal service is similar.

Among these super carriers there are disparate strategies regarding their intermodal equipment that affects their use of intermodal service and the subsequent flexibility of their programs for additional diversion. They may have standardized the fleet on a spring ride, lift capable trailer that moves equally well by truck or rail. This makes their intermodal operation more flexible, but may exclude them from certain commodity groups where air ride equipment is desirable. Another carrier may have a fleet mix containing containers, air ride trailers, and spring ride trailers. These carriers may have a more diverse commodity base but issues of equipment balance restrict their intermodal operations. Another of the carriers in this classification utilizes only rail trailers and containers in its intermodal program so the issues of balance are non-existent for them, but they depend on rail balance for availability of equipment.

The carriers in this group that operate truckload fleets have an impact on less than 5% of the total truckload market. However, that 5% is of considerable size. Among this group, truckload, LTL, and package, there is significant opportunity for additional diversion, particularly with a product that will work in the shorter haul markets.

2.2 Large Fleet

Carriers in this category have more than three hundred power units. Generally their operations are national in scope, and the operating companies own new and late model equipment that is well maintained. This group of carriers will have a presence in most major metropolitan areas. Their drivers are most often company employees, although independent operators are not uncommon. The fleet may consist of both long haul and regional elements. Fleets will utilize information technology including weigh in motion, electronic toll, GPS, in-cab communications and others. Fleets are likely already involved in some use of intermodal service. Among this group of carriers are fleets that choose not to use intermodal service as a way to distinguish themselves in the marketplace.

These fleets have large support staff personnel with considerable analytical capability. Support staff will be familiar with intermodal operations and be able to accurately assess economic components of the intermodal decision.

The customer base in these fleets will consist largely of Fortune 500 companies. A large percentage of the traffic is made-up of repetitive flows. Much of the freight activity will be under contract and may be lane specific. Fleets will also provide extensive logistics services to specific clients as well as for-hire transportation services.

2.3 Mid-Size Fleet

A fleet in this category operates between twenty-five and 300 power units. They may be national in operating scope or region specific. The carrier will be present in some major metropolitan areas, but not all. The driver force is likely a mix of company drivers and independent operators under contract to the carrier. Equipment will be a mix of new, late mode and used. The company will own equipment as well as lease equipment from others. Some fleet will have and use various pieces of technology while others may not. While some fleets of this size may be familiar with and take advantage of intermodal opportunities, most will not.

The support staff in these organizations is likely to be small, affecting only the fundamental needs of the operation.

The customer base may include Fortune 500 companies, as well as many smaller shippers. Some work will be under contract, while a considerable amount will happen in what is considered a “spot” market. These fleets are likely to use third party providers to marry with their customers, to enable them to move about their areas in a balanced fashion. Many private fleets operated by shippers would fit into this category. There is considerable opportunity to expand intermodal use in this group if a product is introduced that meets their needs and can be promoted in a manner that makes it attractive.

2.4 Small Fleet

A small fleet has less than twenty-five power units. Many of these fleets have fewer than five trucks. They are primarily independent owner operators and they tend to focus on niche markets, whether regional, commodity, or shipper based. The scope of operations may be nationwide but are more often regional or local in nature. These fleets may employ company drivers or they may be a conglomerate of several owner operators, often family groups. Equipment may be new, late model or used and old. Some fleets may have access to certain technology but more likely they do not. There is little use of intermodal opportunities, as they do not have the infrastructure to support arranging the dray and the rail transportation.

The support staff is very small or does not exist. Personnel are largely focused on finding traffic to fill the trucks and match the balance needs of their network of operations.

The customer base may consist of one or several “anchor” accounts and various relationships with third party providers, including other larger fleets, for whom they provide substitute power.

The carriers in this group are the least likely to use intermodal services and yet the amount of traffic they control, and thus their diversion potential, is significant. The challenge is to provide a service that will be flexible enough for their use and to promote it to them in a way that makes it financially attractive.

3. VDOT Roadside Survey Data

Given the composition of motor carriers in the two corridors, the consultant team sought to determine what potential existed for rail intermodal diversion from the various segments of traffic on the highway.

The VDOT Roadside Survey provided the basis for an analysis of the fleet size make-up for the carriers traveling the corridors. Fleet size is a key factor in determining the likelihood of a carrier’s ability to utilize available or proposed intermodal options.

Among the companies observed in the VDOT Roadside Survey, the following was noted relative to fleet size. Nearly 28% of the fleets fell into the “large” or “super” categories, almost 14% of the fleets were “mid-sized” and 58% were classified as “small”. When the survey is looked at from the perspective of actual presence (number of individual sighting) in the corridor the super and “large” fleets make up the majority of the count.

The group responding in the shipper survey process represented a significant number of private fleet operators. This group covered about 42% of the private fleet operators identified in the VDOT Roadside Survey. It is estimated that the combined results of the shipper and the carrier survey account for upwards of 40% of the trucks identified in the VDOT Roadside Survey process.

The composition of the fleets observed in the corridors was made up primarily of truckload, both dry van and refrigerated, less-than-truckload, express/package, tank and auto-rack. Dry van truckload carriers made up the single largest component followed by less-than-truckload, and express/package carriers. The survey identified a number of local fleets, including LTL and express/package city delivery units, and regional distribution including dry goods, oil, grocery, and drug. There is little likelihood that this traffic can be diverted to rail. Miners Fuel, CVS Drug, Giant Foods, Averitt Express, UPS and Wal-Mart are some examples of local fleet operations observed. The percentage of trucks for I-81 and I-95 are shown in

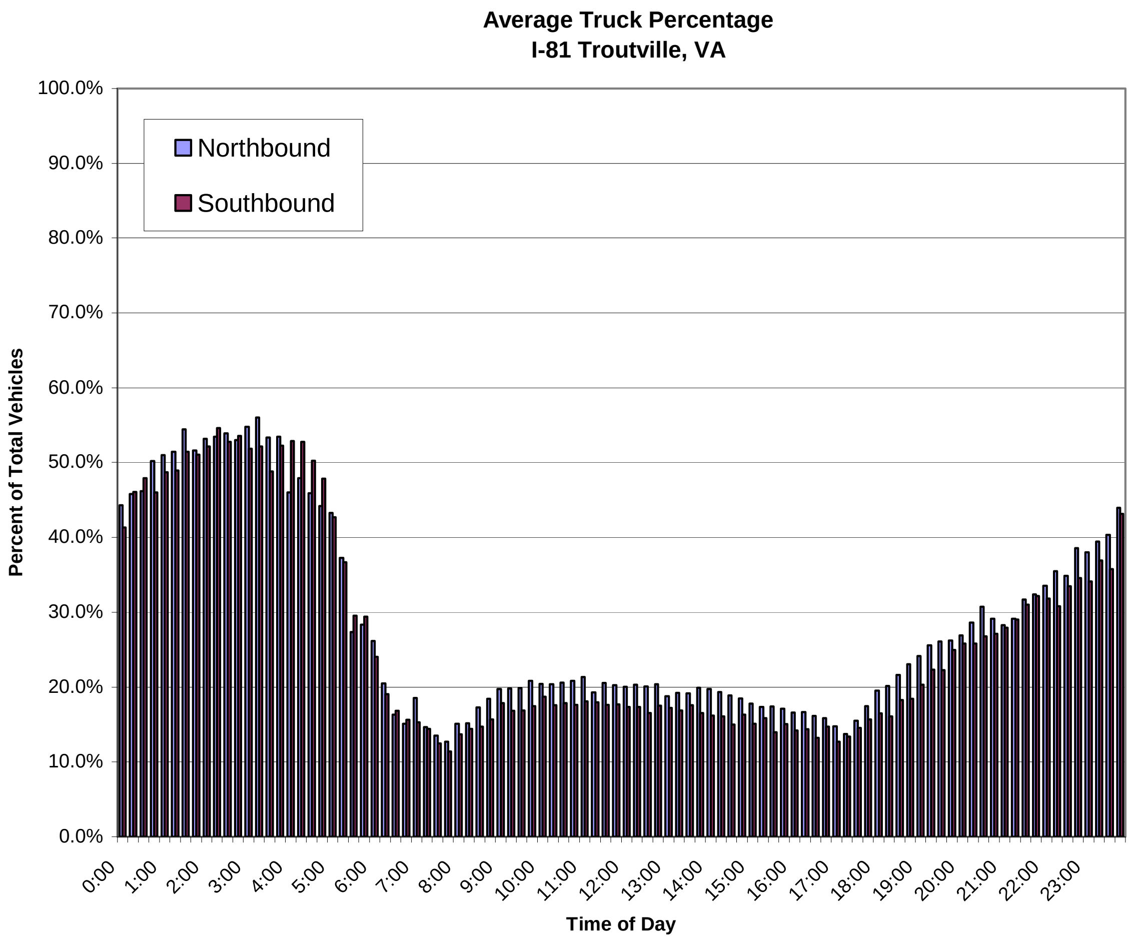
Figure A3.1 and Figure A3.2**.**

3.1 Time of Day Distribution

Truck volumes fluctuate widely across the 24-hour time frame. Observations recorded by VDOT at Dumfries, VA on I-95 indicate that hourly truck counts are highest between 9:00AM and 2:00PM, drop off between 3:00PM and 6:00PM and then rebound between 7:00PM and 9:00PM. The proximity of the Washington, DC metro area may be influencing this pattern, as motor carriers make local deliveries to shippers and receivers in the region. The observations recorded at Troutville, VA on I-81 are similar in some ways to those of Dumfries. Hourly truck counts are high beginning about 9:00AM and remain steady throughout the day beginning a rapid decline after 10:00PM. The distribution of truck traffic on the I-81 and I-95 Corridors by time of day is shown in Figure A3.3 and Figure A3.4**.**

At Dumfries on I-95, truck volumes represent approximately 30% of total vehicular traffic between midnight and 3:00AM. At these times, the volume of trucks is comparatively low, but the volume of motor vehicles is significantly lower. Between 6:00AM and 7:00PM, when commutation and passenger activities are dominant, trucks represent barely 10% of the total traffic, and thus contribute little to overall I-95 congestion.

Like the Dumfries location on I-95, Troutville on I-81 recorded the highest percentage of trucks to total vehicles between midnight and 5:00AM. During this period, approximately 50% of the total traffic is trucks. During the 6:00AM to 7:00PM time frame trucks make up less than 20% of the total traffic observed. Unlike the multiple periods of high truck counts observed at Dumfries on I-95, the steady daytime Troutville truck count suggests more through traffic on I-81 verses local deliveries on I-95. During their peak periods, both highways handle in excess of 600 trucks per hour (total for both directions), but the overwhelming volume of motor vehicles at Dumfries dilutes the apparent impact of any truck related congestion. On the more rural I-81, highway congestion is more easily attributable to motor carrier traffic volumes


Average Truck Percentage
I-81 Troutville, VA
Northbound
Southbound
Percent of Total Vehicles
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0:00
1:00
2:00
3:00
4:00
5:00
6:00
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11:00
12:00
13:00
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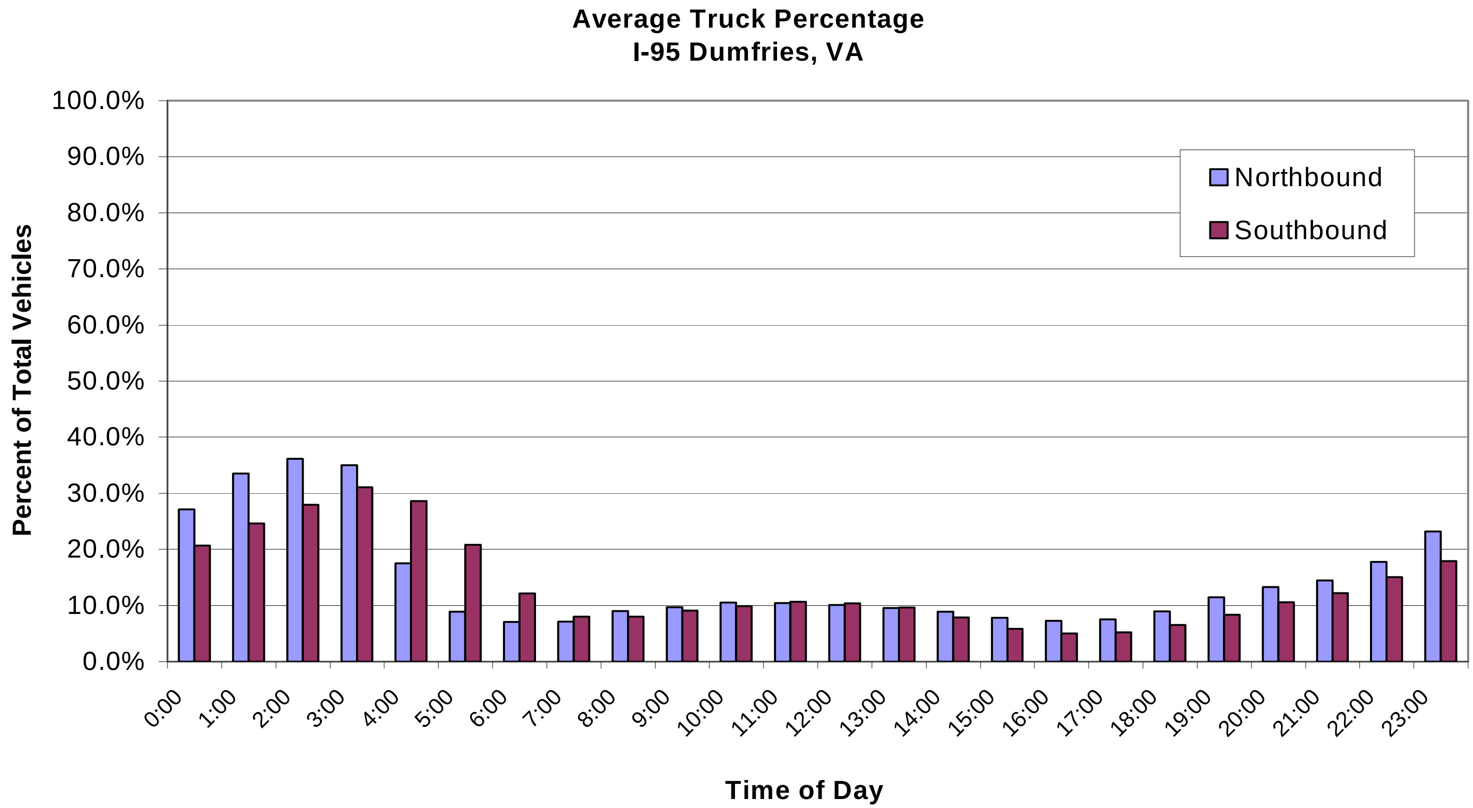
22:00
23:00
Time of Day

Figure A3.1


Average Truck Percentage
I-95 Dumfries, VA
Percent of Total Vehicles
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Northbound
Southbound
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
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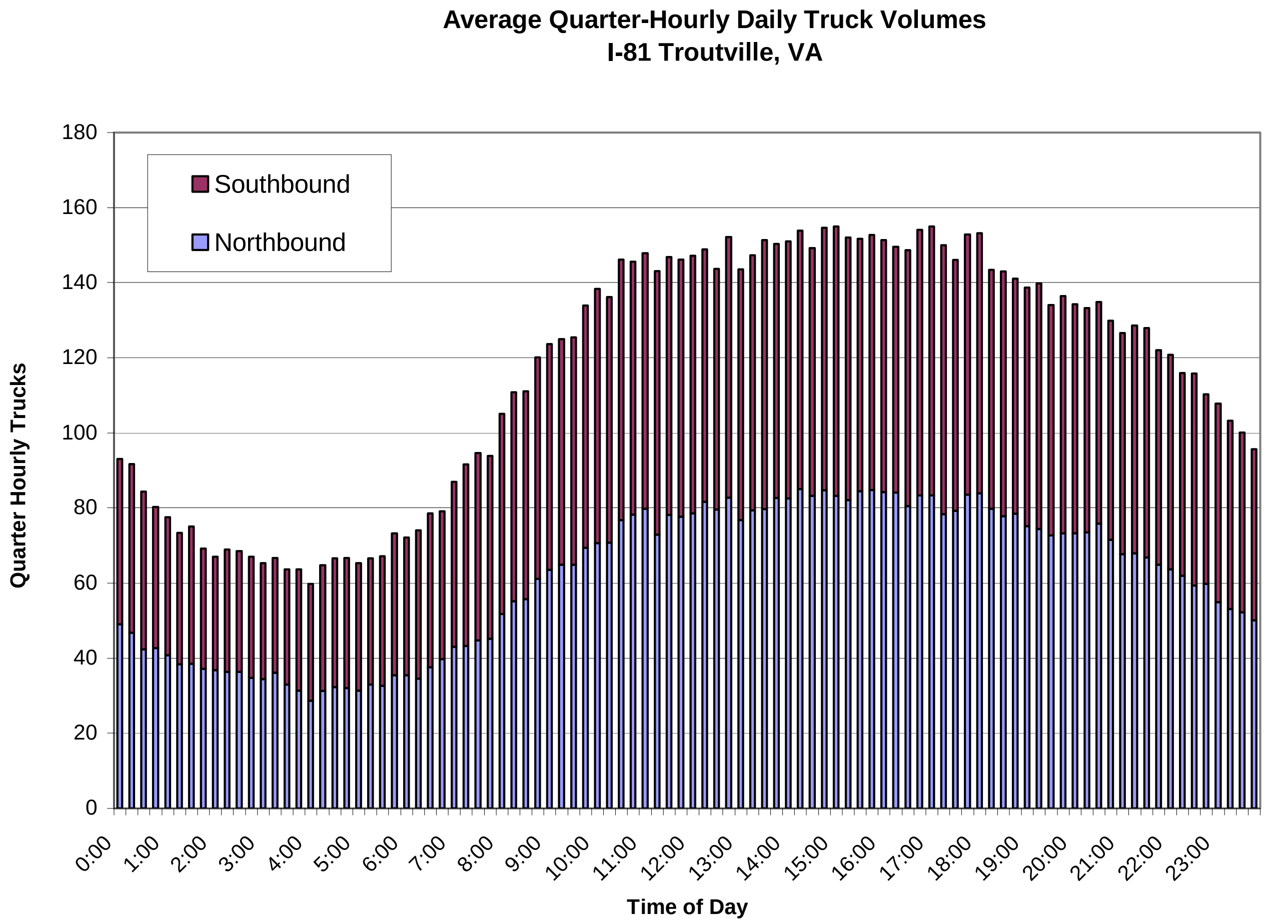
23:00
Time of Day

Figure A3.2


Average Quarter-Hourly Daily Truck Volumes
I-81 Troutville, VA
Southbound
Northbound
Quarter Hourly Trucks
180
160
140
120
100
80
60
40
20
0
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
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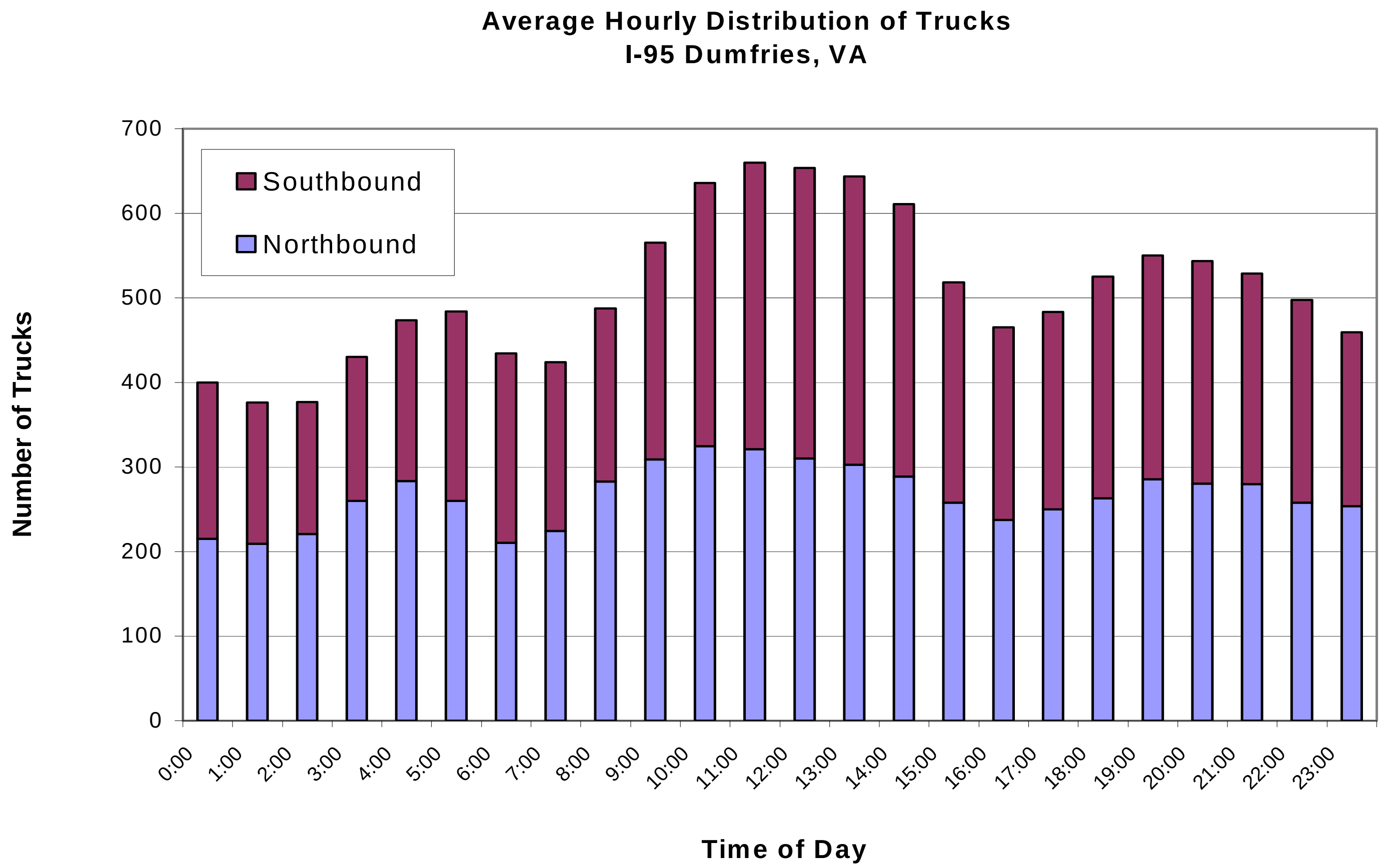
22:00
23:00
Time of Day

Figure A3.3


Average Hourly Distribution of Trucks
I-95 Dumfries, VA
Southbound
Northbound
Number of Trucks
0
100
200
300
400
500
600
700
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
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20:00
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23:00
Time of Day

Figure A3.4

3.1.1 Volume of Freight

From a combination of results carrier survey, the interviews and by using TRANSEARCH freight flow data, the consultant team was able to determine that the majority of the potentially divertible truck traffic fell into two general categories. Lanes providing more traditional intermodal opportunities, moving between Texas and the Southwest to the Northeast offered sizable potential for diversion. In lanes generally not targeted by railroads due to length of haul issues, Georgia, North and South Carolina and eastern Tennessee to and from New England, New York and Pennsylvania provide desirable levels of density. One super carrier reported a count of approximately 40,000 loads annually moving north and 40,000 loads moving south in this shorter haul lane. If the 16-20% diversion statistic were to hold, the result would be about 16,000 shipments. In addition to this volume however, the super carrier also reported there was considerably more traffic to be had in this category, traffic they had "walked away from" previously. Should a suitable intermodal service develop, the company would be again seeking this traffic. A carrier of this stature has the ability to attract a certain amount of traffic just by virtue of its interest. There is every reason to believe that the other carriers in the super category could report similar numbers.

Given the composition of motor carriers in the two corridors (I-81 and I-95), the consultant team sought to determine what potential existed for rail intermodal diversion from the various segments of traffic on the highway.

The composition of the fleets observed in the corridors was made up primarily of truckload, both dry van and refrigerated, less-than-truckload, express/package, tank and auto-rack. Dry van truckload carriers made up the single largest component followed by less-than-truckload, and express/package carriers. The survey identified a number of local fleets, including LTL and express/package city delivery units, and regional distribution including dry goods, oil, grocery, and drug. There is little likelihood that this short-haul traffic can be diverted to rail.

4. Conclusions

Figure A3. 5 indicates that those carriers in the "super" category, while controlling a vast amount of freight, actually represent only a small percentage of the total truckload market. While these carriers offer the best opportunity for diversion, they have already converted a significant portion of their traffic. What remains is traffic in a shorter-haul, more specialized market. The service and price demands in this carrier group will be high. Much smaller carriers move the bulk of the freight in the truckload segment. These carriers have varying levels of sophistication and intermodal interest. Products that

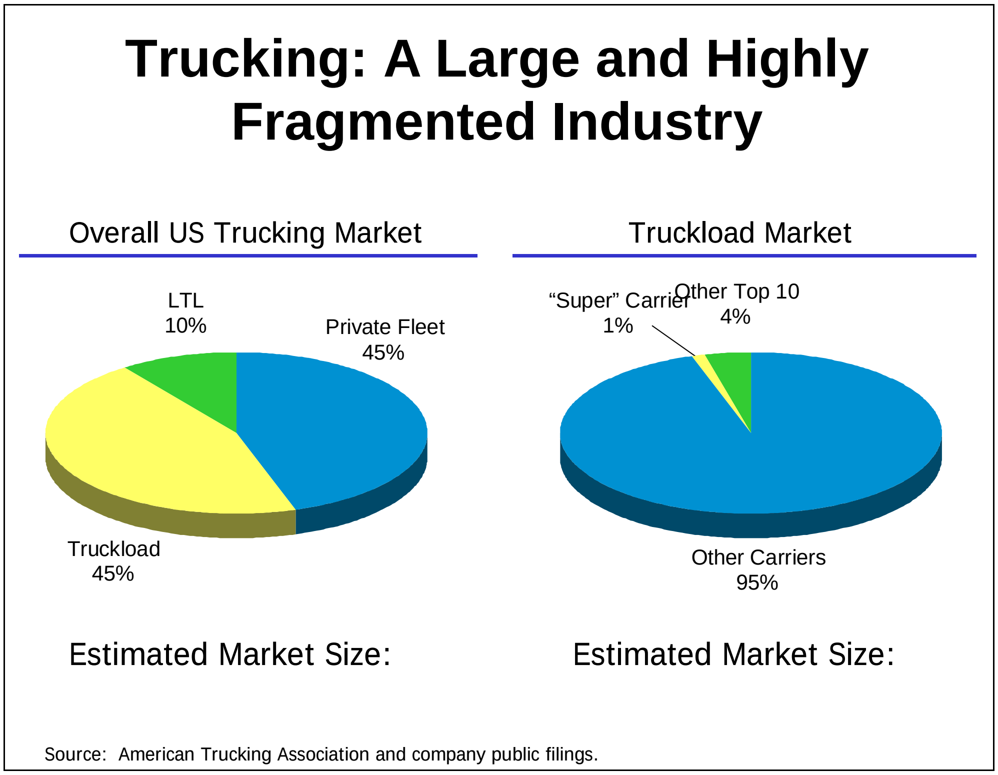

Figure A3. 5

appeal to this group will need to be flexible and vastly different from the more traditional offerings. The super carrier dominates more of the LTL and package traffic but there still exists a group of mid-size players that could have significant impact on diversion opportunities, given the appropriate product.

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THE NORTHEAST – SOUTHEAST – MIDWEST CORRIDOR MARKETING STUDY

APPENDIX 4

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Shipper Survey

1. Purpose

The shipper survey was designed to solicit information from individuals in the private sector who are responsible for making decisions about the shipment of goods into, out of, and through the Commonwealth of Virginia. As specified by the VDRPT, the universe of shippers was divided into three categories:

- Major national retail companies.
- Major national manufacturing companies.
- Major national freight consolidator companies.

The consultant team elected to solicit this information through the use of a mail-out, mail-back survey questionnaire. As explained in more detail below, the objective was to obtain the information from the top transportation/logistics officer of the targeted firms.

2. Goals of Survey

The shipper survey was designed to solicit information about:

- The volume of shipments moving through Virginia by major corridor and mode.
- Opinions about the use of rail intermodal service.
- Criteria used to make decisions regarding mode choice.
- Trade-offs between shipping time and shipping costs.
- Criteria used to measure on-time performance.

3. Survey Methodology

The consultant was responsible for the identification of the top logistics managers for the following:

- 100 of the top 200 *Fortune 500* manufacturers,
- 12 of the top 20 *Fortune 500* retailers, and

- 15 of the top 20 freight consolidators.

These quotas were specified by the VDRPT. The identification process consisted of the following steps:

- Identification of firms comprising 150 percent of each requirement for the above listed categories.

- Production of generic directories (including street address, web site, and telephone numbers) for the corporate headquarters of the firms identified in Step 1.

- Identification of the top logistics managers of the firms identified in Step 1 by scanning their web sites and by calling the general corporate telephone numbers identified in Step 2.

- Identification of the top logistics managers of some of the firms identified in Step 1 using the alternative methods described below.

- Production of directories (including name, title, postal address, telephone, fax, and e-mail addresses) for the top logistics managers identified in either Step #3 or Step #4.

- Follow-up gathering of contact information was performed by telephone with additional mailings.

Each step is described in more detail below.

3.1 Identification of Firms

The top *Fortune 500* manufacturers and retailers were identified by searching the *Fortune 500* web site. The top freight consolidators were identified from a *Directory of Logistic Providers* contained in the September 30, 2002 issue of Traffic World magazine.

3.1.1 Production of Corporate Directories

The generic directories for the manufacturers and retailers were compiled from a purchased Fortune 500 address list. The generic directory for the freight consolidators was derived from the Traffic World directory. The three directories were also supplemented by information compiled from Reebie's *Freight Locater* database. It provided information for six manufacturers, two retailers, and nine freight consolidators not found elsewhere.

3.1.2 *Identification of Logistics Managers by Telephone*

The consulting team scanned the web sites and called the general corporate telephone numbers of more than 100 of the firms identified in Step #1. A limited number of the corporate web sites provided useful information.

The identification of the logistics managers (particularly for the manufacturing firms) through telephone calls encountered obstacles such as:

- Many of the firms have a corporate policy of not responding to any surveys.
- Many calls were answered by voice-mail and requested return calls were not made.
- In some cases, the firm did not move goods through, into, or out of Virginia and therefore declined to respond to the survey.

3.1.3 *Identification of Logistics Managers by Other Means*

In addition to identifying the top logistic mangers by telephone, other options were explored. These options included:

Searching the Internet for the sites of logistics and/or transportation organizations that might have readily accessible membership directories that could be perused for identification purposes.

Identifying logistics and/or transportation organizations that would be willing to sell their membership directory. It was discovered that many membership lists were not to be used as mailing lists or would not contain the information being sought. One sub-set was eventually purchased, providing additional, but limited contacts.

3.2 *Production of Directories*

Study team researchers compiled a directory (including name, title, postal address, telephone, fax, and e-mail address) of the top logistics managers identified in either Step 3.1.2 or 3.1.3. This directory was in turn used to generate letters transmitting the survey instrument to the top logistics managers, and then to transmit the survey package via fax or e-mail if such became necessary during the course of follow-up telephone calls.

3.3 *Follow-up*

A limited response rate to the initial mailing of survey packages indicated that additional follow-up would be required. Consultant staff therefore attempted to contact by telephone each of the individuals to whom the survey had been mailed. The purpose of the call was twofold: 1) to ascertain whether or not the survey package had indeed reached the person to whom it was addressed; and, if it had, 2) to determine whether or not the recipient had made progress on filling out the survey. In many instances, the intended recipient of the survey package indicated that he/she did not recall seeing it. In these cases, a survey package was sent by fax or by e-mail.

In an attempt to increase the response rate, another set of survey packages were mailed March 18, 2003 to an additional 40 firms with the letter of transmittal addressed to "Traffic Manger." Assistance was also requested from the Norfolk Southern Railway for help in identifying contacts for selected companies.

During the last half of March, a concentrated effort was made by telephone to solicit survey responses from individuals and firms to whom the survey had been previously sent. This also included calls to firms that had not previously received the survey package in the mail. Materials were forwarded to these firms by fax and by e-mail.

3.4 Summary

Using the processes described above, the top logistics managers of 75 firms were identified. Letters transmitting the survey instrument were specifically addressed to these individuals. Survey instruments with transmittal letters addressed to the "Director of Transportation/Logistics" were sent to an additional 112 firms for whom a specific individual had not been identified. The team's initial mailing therefore totaled 187 survey packages.

3.5 Additional Work Effort

Following the efforts on the survey work described above, the decision was made to make a secondary attempt to collect more shipper information. There were some surveys that were received following the original deadlines that were incorporated into this later analysis. There was also an effort made to contact additional shippers. Several accounts were identified and interviewed, either in person or by telephone. Two of these were "super" national retailers with significant operations in and around the study area. The feedback from these interviews has been included in the discussion of the results below. This discussion includes the original survey work, the late arrival surveys, and the follow-up interviews.

3.6 Survey Documents

As stated above, the consultant team elected to solicit appropriate information from major national retail, manufacturing and freight consolidators primarily through the use of a mail-out, mail-back survey questionnaire. The survey instrument was transmitted via a letter signed by the Secretary of the Virginia Department of Transportation, Whittington

W. Clement. Recipients were asked to mail back the completed survey. The survey package included an addressed and postage paid return envelop for this purpose.

3.7 Collection of Results

As of July 2003, the consultant had received 34 survey responses containing answers to some or all of the questions posed. The breakdown of the returned questionnaires by category of shipper is shown in Figure A4.1.

Number of Survey Responses Received by Category of Shipper (July 2003)

Category	Number
Retailing	**7**
Manufacturing	**23**
Freight Consolidator	**4**
Total	34

Figure A4.1

3.7.1 *Private Fleet Operations*

Through both the original survey work and the additional interviews, responses were received from several shippers with significant private fleet operations. When reviewing the VDOT Roadside Survey counts, these companies with private fleets represented 42% of the trucks that were counted.

4. Results of Shipper Survey

The following discussion relates the findings from the Shipper Survey efforts in terms of what factors are important to these decision makers when choosing between rail intermodal options and all-highway alternatives. It also integrates information obtained in the follow-on interviews conducted in July and August. It displays the range of factors, both positive and negative, and the consistency among respondents in placing importance on individual criteria when making decisions.

The results demonstrate that speed and reliability of delivery are the most important requirements that must be present in order to allow for selection of intermodal options. Cost serves as an incentive or a disincentive but is not the dominant decision factor. That is, typically, a shipper will consider intermodal as a viable option if there is a price advantage versus all-highway --- provided that speed and reliability requirements can be met or approximated by the intermodal operators.

Follow on interview work revealed that shippers recognize there are serious truck capacity issues looming and that highway congestion is a significant issue to their operations. They are eager to find and embrace alternate modes of transportation but they want those modes to be equivalent to truck transportation in service and reliability.

4.1 Self-selection Bias

The basis of survey sampling is randomization. Each person or event in the target population should have an equal probability of being selected and contributing information to the overall sample. Random selection of these equal probable events minimizes potential biases in the collected sample data.

Surveys that depend on the completion and return of a form are not random and are therefore subject to biases7. This form of bias is known as "self-selection." The conductors of the survey are not selecting the respondents, but instead the respondents are each making their own decision whether or not they will participate. This creates a division in the target population of those willing to participate and those unwilling to participate. The question then becomes whether or not this self-selection bias can lead to reliable results or conversely can render erroneous ones.

For the Virginia Intermodal Marketing Survey, the critical issue is whether or not this bias is related to potential use of rail intermodal services. If those choosing not to complete and return the survey are doing so because they have no interest in using rail, then gauging the potential for rail diversions from the completed surveys will overstate the estimates. If it should turn out that the self-selection bias is not related to potential use of rail service, then the sample will provide a good representation of potential rail usage. In an effort to understand the nature of the self-selection bias, the study team tabulated the results of follow-up discussions with a group of non-responders. The results are displayed in Figure A4.2.

7 The US Census is an exception to this rule since all residents are required by law to complete and return the Census form. The Census is a complete enumeration and not a survey.

Summary of Survey Turndowns

Category	Problem w/ Name or Address	No Explanation	No Surveys Policy	Little or No Facilities or Traffic in Virginia	Non-Asset Based Company	Total
Manufacturers	3	1	12	6	--	22
Retailers	--	1	1	1	--	3
Freight Consolidators	2	1	1	2	2	8
Total	**5**	**3**	**14**	**9**	**2**	**33**

Figure A4.2

Figure A4.2 Key:

- Problems w/ Name or Address – Survey packages returned because of incorrect name or address.
- No Explanation – Survey packages returned w/o explanation, or declined w/o explanation.
- No Surveys Policy – Corporate policy is to decline all survey requests.
- Little or No Facilities in Virginia – Shipper does little/no direct business in Virginia, or does not ship by truck through Virginia.
- Non-Asset Based Company – Freight consolidators who do not own trucks nor ship nor receive freight.

The most popular reason for refusing to complete the survey was a corporate wide no survey policy. The second most popular response was a lack of facilities and traffic in Virginia. None of the people interviewed listed lack of interest in rail as the primary reason for failure to respond to the survey. While this does not provide positive proof that the completed surveys are free of damaging biases, it does provide a higher level of confidence with the survey data.

4.2 Survey Results

This section contains a detailed description of the raw survey results; i.e., it follows the format of the original twelve questions contained in the survey form [see Appendix 7]. The survey respondents provided a good cross section of major national retail, manufacturing, and freight consolidation companies[8]. Additionally, information obtained in the interview process has been added for this final publication in commentary form.

8 For confidentiality reasons all results are reported in aggregate.

The decision to use rail intermodal service can be made in three places. The shipper can determine on their own that they wish to use or exclude rail service as an option. The motor carriers they utilize can recommend intermodal products and in some cases substitute service without the shippers specific approval. Thirdly, shippers can place some traffic with third party providers who can make an intermodal decision. The survey revealed that most of the respondents deal directly with the carriers and thus any decision to shift modes is made in negotiations between the shipper and the carrier [See Figure A4.3]. Approximately one-fourth of the respondents use an outside source for managing their logistics and while they have an interest, they may not actively participate in the intermodal decision. The 'Other' category included shippers managing their own private fleet of equipment, in which case modal diversion are unlikely; and shippers using a national bid system for selecting carriers which will include a variety of choices that include both truck and intermodal.

Approach to Freight Transportation Decisions

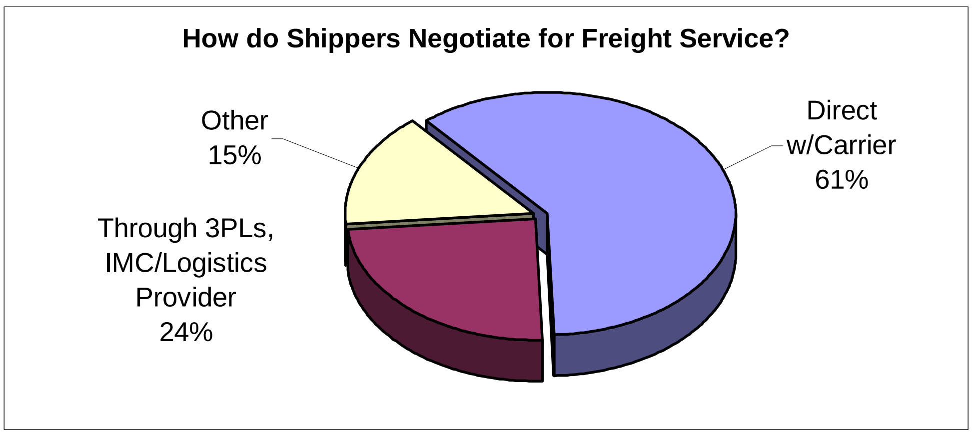

Figure A4.3

The truck volumes represented in the survey responses are geographically dispersed and represent a mixture of long and short hauls moving in all directions. The commodity mixture includes: aluminum cans, glass bottles, clay and ceramic items, plywood, hydraulic equipment, lumber, paper, carpet, tires, beer, electronics, lubricants, auto parts, food, paint, and a large proportion of retail consumer goods, groceries, and general merchandise shipments.

The majority, over 60%, of the respondents relies heavily on trucking as their mode of transportation. The remaining shippers use a greater mixture of rail and trucking, with rail usage ranging from 20% to 90% depending on the corridor, commodity, and company. The commodities moving by rail include clay and non-metallic minerals, carpet, tires, some food and beverages, and a large amount of consumer retail products.

The common perception is that rail is less expensive than truck, but it also provides less reliable service and longer transit times. The survey confirmed this perception as illustrated in Figure A4.4. Everyone completing this part of the survey stated that the advantage of rail intermodal over truck was 'cost.' The primary disadvantages were transit time and reliability, followed by more difficult to use, lack of accessibility, and increased loss and damage. Among specific problems with rail intermodal, transit time (speed) was the greatest; and other factors as identified by the survey respondents, include:

- Timing is not compatible with client requirements
- Too slow (compared to over-the-road trucking)
- Poor quality drayage at endpoints of the rail move
- Increased probability of damage
- Lack of consistent service (on time reliability)
- Closing of intermodal terminals
- Multiple carriers between west and east coasts
- Only provides savings for lanes greater than 1,000 miles
- No convenient service available (in certain lanes)

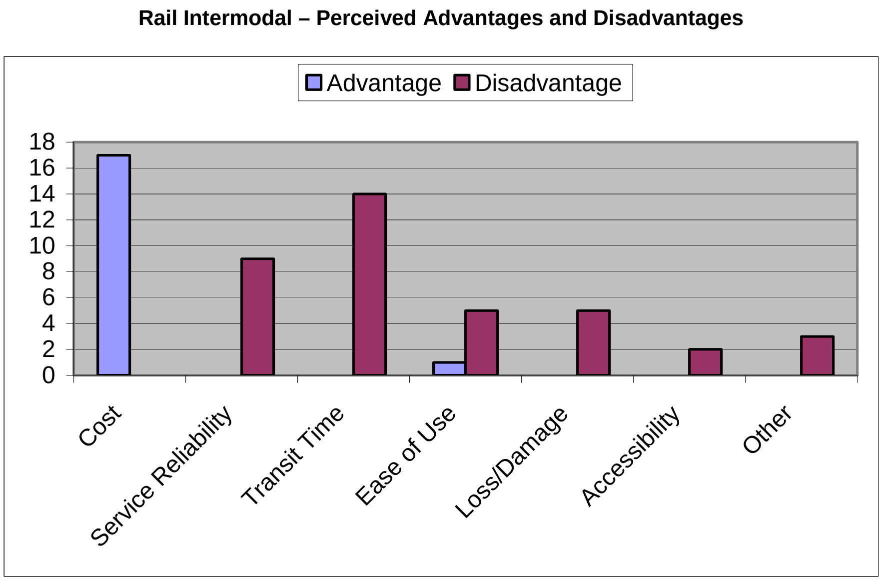

Figure A4.4

Follow up interview work revealed that equipment concerns also dictated a selection of truck over rail. One of the nation's largest shippers revealed a need for enhanced intermodal refrigerated services. In Virginia this is a particular concern during winter months when the volume of reefer traffic increases as carriers choose to use the southern routing across I-40 and up I-81 as they move from California and the Southwest to the Northeast. In warmer months much of this traffic moves on I-70 and by-passes Virginia. There are other products that follow this same pattern that are not refrigerated, items such as beverages and snack products and similar temperature sensitive commodities. Other products requiring tanks and flat bed trailers are not included in the traditional intermodal product offerings and so those type shipments represent additional opportunity with non-traditional service design.

Selection of a freight carrier is based on many factors, as illustrated in Figure A4.4. Each survey respondent was asked to distribute 100% among the various decision factors, with a higher percentage being given to the more important factors. Figure A4.4 shows both the range of responses (vertical bars) and the average response (horizontal dash). On-time performance (a combination of 'speed' and 'reliability') and price each accounted for 30% of the decision to use a specific freight carrier. Transit time, itself, accounted for 15%, indicating that it is a leading factor in any assessment, but different from 'reliability' alone. There was evidence that when a shipper places 'reliability' as the most important factor, it is with an unstated understanding that absolute 'transit time' (or schedule) must be within an acceptable envelope by comparison with over-the-road trucking alternatives. The remaining 25% were distributed among various other categories, such as equipment type and supply, loss and damage records, and financial stability of the carrier.

Additional work around this topic in the interview process further enforced the idea that rail transit time and reliability of service must be equivalent to single truck transit in a "door to door" operation. That is, the time from pick-up at the shipper to delivery at a consignee must be equivalent to truck transit, including ramp time and circuity in the routing.

Freight Carrier Selection Criteria

(Vertical Bars Represent Range, Horizontal Dashes Represent Average Response)

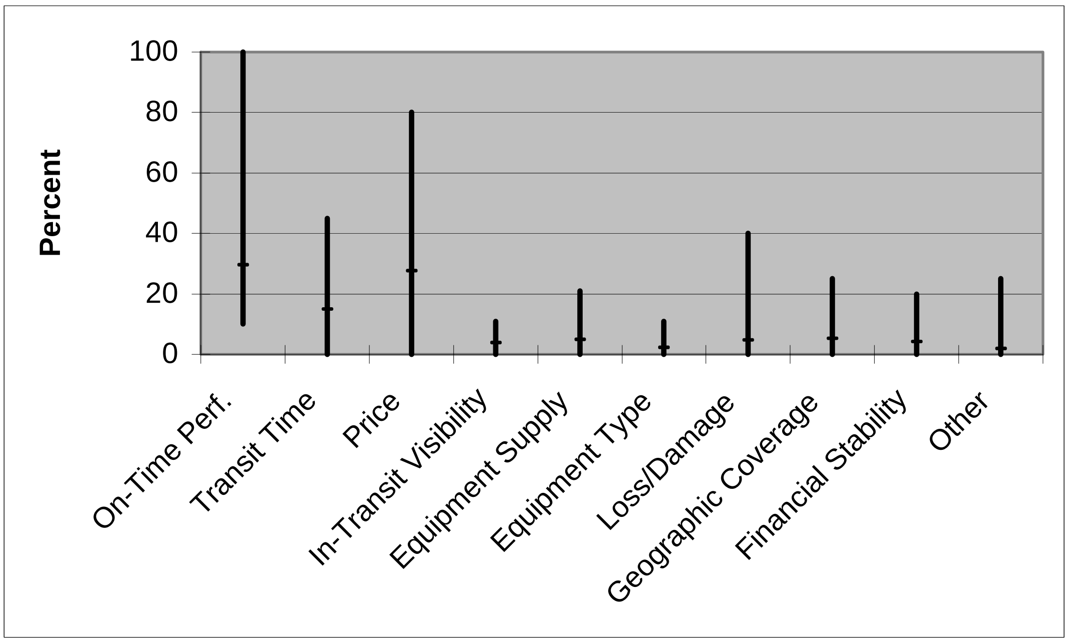

Figure A4. 5

The next series of survey questions explores transit times. One-half of the responses to a question concerning changes in transit time and diversion of truck to rail intermodal, indicated that they would be willing to use rail if they could obtain the same transit time. This naturally led to an exploration of the relationship between transit time and transportation rates.

Figure A4.6 contains a graph depicting the trade-offs between transit time and rates. The shippers were asked to provide the rate reduction that would entice them into accepting an increase in transit time of 5%, 10%, and 25% respectively. The top line in Figure A4.6 shows that, on average, shippers expect a 10% rate reduction for a 5% transit time increase, a 15% rate reduction for a 10% transit time increase, and a 25% rate reduction for a 25% transit time increase. The bottom line shown in Figure A4.6 contains the opposite question: How much is a reduction in transit time worth? Despite the importance throughout the surveys on transit time, most shippers are not willing to increase rates to achieve a further reduction in time even though this could lead to a reduction in inventory carrying costs. In fact, only three respondents said they were willing to pay a premium for a 5% reduction in transit time. About half of the respondents stated that they were unwilling to increase rates regardless of the reduction in transit time. Additionally, there were some shippers unwilling to consider any intermodal service that did not provide a single truck competitive transit with a reliability in the 95 to 98% range.

4.2.1 Sensitivity of Transit Time versus Rate

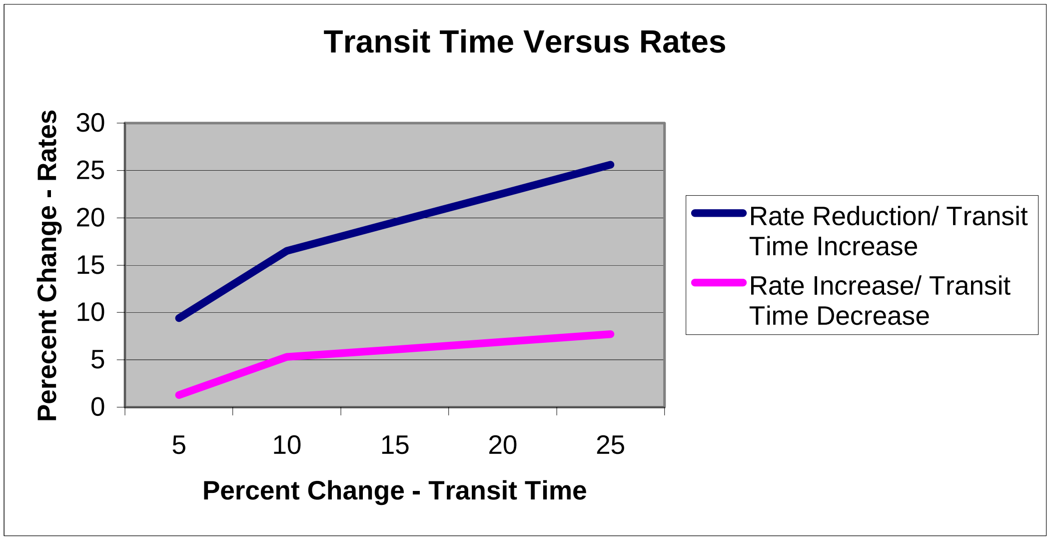

Figure A4.6

The results of a question linking the transit time/rate curves in Figure A4.6 with potential truck to rail diversions is contained in Figure A4.7. To step through an example, consider the row with a 5% increase in transit time and a 10% decrease in rate. The respondents indicated that they would be willing to divert 10% to 20% of existing truck traffic to rail under these conditions. Please keep in mind that not all respondents answered this question, nor did all respondents complete all parts of this question. In other words, Figure A4.7 does not attempt to address non-divertible traffic by interpreting blanks as zeros. What Figure A4.7 does show, is that for the segment of traffic susceptible to diversion[9], there is a willingness to accept an increase in transit time if a reduction in transportation costs can be achieved. This willingness is mostly attributed to specific commodities that have a concentrated volume and a more “bulk” type behavior. In the high volume consumer retail market this tendency toward longer transit does not exist. Exhibit 6 also shows a willingness to use rail if transit times can be reduced without a corresponding increase in rates. Railroads cannot expect to divert traffic from trucks by merely matching rates and transit time.

Truck to Rail Diversions Based on Transit Time and Rates

Change In Transit Time	Change In Rate	Truck to Rail Diversion (Low)	Truck to Rail Diversion (High)
Increase in Transit Time, Decrease in Rate			
25%	-10%	30%	30%
25%	-15%	5%	5%
25%	-20%	90%	90%
25%	-30%	50%	50%
25%	-40%	100%	100%
10%	-10%	5%	5%
10%	-20%	20%	25%
5%	-10%	10%	20%
Decrease in Transit Time, Increase in Rate			
-5%	0%	5%	40%
-10%	0%	30%	90%
-25%	0%	40%	90%
-25%	5%	20%	20%

Figure A4.7

Throughout the survey responses, the key factor for most shippers was on-time performance. The final three questions on the survey explore this issue by determining how on-time performance is measured, how sensitive the respondents really are to on-time performance, and what exactly is the meaning of “on time.”

Figure A4.8 shows that most of the respondents depend on the carriers to provide the measurement of on-time performance and that they like to track every shipment. It is interesting to note that while some track only hot or problem shipments, every respondent

9 Traffic susceptible to diversion requires the right mixture of commodity and length of haul. Short haul, high value, time sensitive goods will not use rail regardless of the rates or transit times.

is involved in some form of on-time performance tracking and measurement. This enforces the perception that on-time performance and dependability are the most important elements in selecting the carrier.

Measuring On-Time Performance

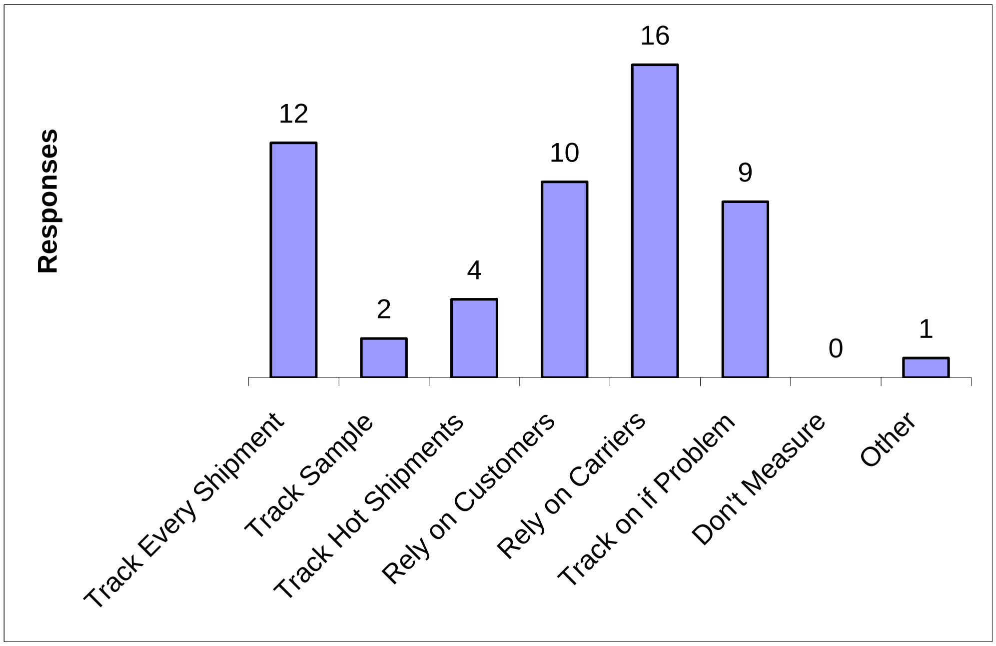

Figure A4.8

Figure A4.9 explores how sensitive the respondents are to on-time performance. Seventeen percent (17%) of the respondents are extremely sensitive to on-time performance and claim that they would be willing to switch carriers to achieve a 2% or less improvement in performance. This is very commodity specific, with food, fruit, and small packages being the most sensitive to performance changes. On the other end of the scale, 21% claimed that it would take a 10% or greater change in on-time performance to result in a change in carriers. These respondents were moving goods such as empty bottles and beverages. In the interview work following the survey the monitoring of performance was stressed more strongly. The largest retailer in the nation monitors performance on every shipment using their own measure in addition to the carriers' measurements. High volume shippers in today's market anticipate a reliable pick up and delivery performance in excess of 95% on time, some using 98% as the goal.

On-Time Performance – Threshold for Shifting Carriers

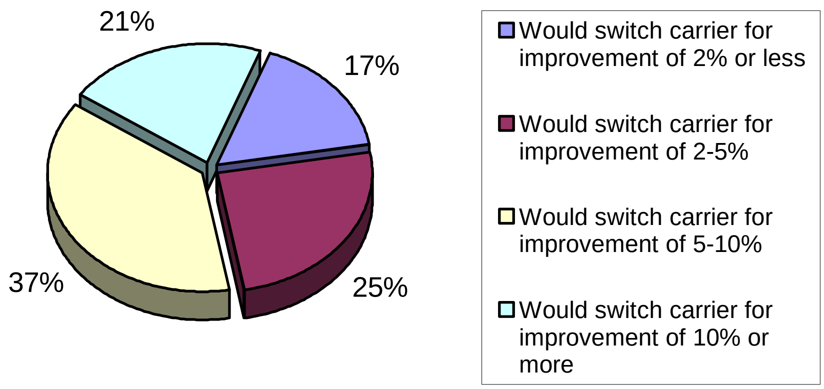

Figure A4.9

The final survey question attempts to better define the term "on-time". This was difficult for some of the respondents to answer since it varies with commodity and location. Some time windows were extremely tight with "on-time" being defined as no more than 15 minutes early and zero minutes late. About 25% of the respondents have no tolerance for shipments that are even one minute late. On average, a shipment is on time if it is no more than seven hours early or three hours late. More than twelve hours early or eight hours late is considered unacceptable.

5. Follow Up Interviews and Analysis

In the process of the follow up interviews it was clearly confirmed that there is a large volume of freight available for rail diversion in the two major lane categories that were identified. Those lanes were the long haul southwest to northeast, and the shorter haul southeast to northeast. Additionally some issues around commodity and equipment type were raised that add an additional quantity of shipments to the diversion pool.

Shippers are certainly concerned about the increasing shortage of truck capacity and about the effects of congestion on truck operations. The largest shippers in the nation are eager to divert more business to the rail and are aggressively seeking those alternatives. But they are not willing to make this shift at the cost of transit time and reliability. In several cases the Florida East Coast service from Jacksonville south was cited as a good example to use for product design.

The existing intermodal service from Texas and the southwest to the northeast falls far short of the transit time and reliability goal. Freight in this lane would be quickly diverted if a product were introduced that was more in line with service provided in other long haul lanes. The shorter haul lanes require the design of new services. As these services were discussed there was clear interest. Also, a major retailer has a strong desire to see an enhanced refrigerated intermodal service develop and they reported that there is a sizeable quantity of traffic to divert in this category.

THE NORTHEAST – SOUTHEAST – MIDWEST CORRIDOR MARKETING STUDY

APPENDIX 5

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Survey of Current Railroad Operations

1. Rail Carrier Interviews

While the Shipper and Motor Carrier surveys identified rail intermodal diversion opportunities, most indicated a fundamental dissatisfaction with the current level of service offered by railroads in the study corridors. To better understand the apparent disconnect between the desires of the rail intermodal shipping community (shippers and motor carriers collectively), we initiated a series of discussions with representatives from Norfolk Southern and CSX Transportation about their current intermodal strategies, and the environmental circumstances that have limited their ability to attract additional traffic from the highway. These meetings helped identify a number of issues that reduce the effectiveness of intermodal operations, and hamper the railroad's desire to grow traffic in the study lanes.

1.1 Norfolk Southern

Norfolk Southern (NS) currently operates a mix of COFC and TOFC services between the Southeastern United States and the Northeastern United States. Although NS theoretically connects numerous city pairs between the two regions, two corridors represent the preponderance of the traffic. They are: Atlanta to Harrisburg Pennsylvania and the New York Region; and Memphis to Harrisburg, Pennsylvania and the New York Region.

Current service in these two corridors is provided by a single through train between Atlanta and the Northeast (#214) and a connecting block of cars from a Memphis to Atlanta train (#226), which is combined with the locally originated volumes in Atlanta for movement north. These two trains have experienced significant increase in business since the absorption of Conrail, and are expected to continue to post additional growth in the coming year. North-South growth overall has been among the fastest growing segments of NS intermodal, and represent, a substantial portion of the firm's targeted long-term growth.

The railroad's focus on two select corridors represents the evolution of a strategy that seeks to center the scarce resources of the company into the most profitable traffic available. Although a significant amount of excess capacity exists in the network overall, the relative complexities of NS' extensive intermodal operation make it difficult to combine unused train, terminal and route capacity. Thus, significant management effort is required to balance available capacities with available traffic volumes.

Factors currently limiting the growth of traffic in North-South corridors include terminal capacity, train capacity, line capacity, empty equipment availability and interline cooperation. These factors are explained in more detail below:

1.1.1 Terminal Capacity

For Norfolk Southern, as for most railroads, new intermodal terminal construction is a lengthy and difficult process. Local resident opposition, zoning restrictions, environmental mitigation, and land availability have severely inhibited railroads seeking to expand intermodal terminal operations. NS' recent construction in Austell required some ten years of negotiations and development, while the expansion of the Rutherford, Pennsylvania (Harrisburg) terminal necessitated nearly six years of effort. The current manifestation of these arduous initiatives is that current terminal capacity is considered fixed, and that absent significant productivity and throughput improvements, NS Intermodal Marketing is managing the mix of traffic within individual terminals to maximize overall income.

1.1.2 Train Capacity

Although NS recognizes there is significant additional capacity in its train network, this capacity is not uniform across days of the week, nor is it consistent with terminal excess capacity. In the case of the North-South traffic, that is the focus of this study, there is currently excess capacity on the trains operating in the corridor. The availability of excess capacity on trains 226 and 214 (and their southbound counterparts) suggests that some additional traffic can be accommodated, but that significant highway diversions will require the current operation be supplemented with more trains in the corridor. A "new train start" generates significant additional fixed costs to the network, and is usually initiated only when there is a sufficient and consistent baseload of traffic to offset a considerable portion of these additional operating costs. Train operating costs perform in a stepped fashion, while revenues are more linear. The addition of a new train increases the expense of operation substantially, until unit volumes and thus revenues become equal. Thus in the North-South corridor, NS is currently seeking to maximize the utilization (and hence the income) from its currently operating trains before adding capacity to the network.

1.1.3 Line Capacity

Norfolk Southern's rail network in the southeastern US contains many single-track segments. These segments are handling substantial train volumes, and in some cases, cannot easily handle additional traffic. NS is working to add capacity at the most severe of these "choke points", but some that do exist in the North-South corridor may not secure internal funding for some time. NS is prioritizing and scheduling trains to address these capacity constraints, but the consequence of the volume is that on some lines, and during some periods, train operation slots may be unavailable. And whereas the addition of one or two trains can be accommodated on most lines, the six or eight departures that might be required to effect significant highway diversions are currently unavailable.

1.1.4 Empty Equipment Availability

In the Eastern United States, most markets are consumption oriented, and thus have less freight moving outbound than moving inbound. To overcome this dearth of return loads, motor carriers will reposition empty equipment to the next closest traffic surplus region in an effort to reduce empty miles. This practice – called "triangulation" – means that trucks moving loaded to the Northeast from the South will often move empty to the Midwest and then return loaded to the Southeast. The flexibility to dispatch empty trucks in any direction to maximize the number of revenue generating miles is not easily replicated in rail intermodal. Rather, because terminal and drayage expenses represent a significant portion of the total door-to-door cost equation, railroads tend to cycle equipment back to its original point of origin to balance locomotives, railcars, trailers and containers – even if a substantial portion of that equipment is moved empty. This effectively raises the costs of intermodal relative to motor carrier transport, and thus in lanes where there is a significant imbalance between inbound and outbound freight, railroads are often less competitive than trucks.

According to its experience in the market, NS has found that several of the principal origination points for traffic along the study corridors are severely imbalanced. These include Huntsville, AL; New Orleans, LA; and Memphis, TN. For these points, freight is primarily outbound, requiring that NS reposition empty trailers, containers and railcars to these markets. Where low-cost and consistent supplies have been available – such as Memphis, TN intermodal services have been competitive vis-à-vis highway transport. Thus where the supply of empty equipment has been more sporadic or expensive, NS has provided a more sporadic and expensive service to the market. While NS recognizes the opportunity to divert highway traffic to rail intermodal in these regions, the unavailability of empty equipment has made these services less attractive to the railroad, and the equipment formerly assigned to these markets has been reassigned to more profitable corridors.

1.1.5 Interline Cooperation

Two regions that appear to be contributing significantly to the North-South traffic on I-81, are Central and Eastern Texas. Norfolk Southern and the Kansas City Southern Railway (KCS) have teamed up to provide through intermodal service from Dallas, TX. The KCS portion of the service is via an interline service arrangement with Norfolk Southern over the Meridian, MS gateway. Both NS and KCS have identified significant traffic potential in this corridor, and the carriers are working to capture this freight – currently moving on the Interstate – to an improved rail intermodal product. In addition to the work with KCS, Norfolk Southern's Intermodal Group has sought to negotiate interline operating agreements with BNSF and UP. It was hoped that these railroads would forward Texas traffic to NS at New Orleans and Memphis for subsequent movement to the Northeast via Norfolk Southern. To date however, these initiatives have met with only limited success. The Western railroads (BNSF and UP), have historically preferred to concentrate their efforts – and hence their assets – in markets local to their own system. With the rapid growth in rail intermodal demand, intermodal equipment is in limited supply. Most rail carriers have discouraged the development of less profitable interline services (except transcontinental services) in favor of local markets where scarce assets can be managed more tightly.

1.1.6 Conclusions

It is apparent that NS is pursuing a logical strategy for intermodal market development. The firm is focusing its energies and its limited resources on those corridors that provide the greatest operating income. The factors that have influenced the company's commercial choices include terminal capacity, train capacity, line capacity, empty equipment availability, interline service performance, and interline cooperation. To some degree, each of these factors exists in the North-South Corridors that are the focus of this study. While none of these factors is insurmountable, each represents an added expense that when weighed against an available alternative prevents some intermodal lanes from developing, while others thrive.

But as Norfolk Southern's current intermodal network equilibrium is economically driven, so the future solution will be established. Changing the current cost equation for under-served markets will fundamentally change the embedded priorities, and can achieve Virginia's desired but currently unattainable results.

1.2 CSX Transportation

CSX Intermodal currently operates seven trains along the study corridors. Trains Q-172/173 operate between Jacksonville, Florida and South Kearny, New Jersey and are primarily composed of UPS and premium service truckload traffic. Train Q-176 also operates from Jacksonville, Florida to South Kearny, New Jersey and handles a large volume movement of empty trash containers from Collier, Virginia to the New York region, in addition to conventional intermodal equipment. Trains Q-174/175 operate between Jacksonville, Florida to CSX's ramp west of Boston. CSX also operates a pair of trains – Q-195/196 that operate between Atlanta, Georgia and South Kearny, New Jersey. These Atlanta trains move south along the I-95 (former Richmond, Fredericksburg and Potomac and Seaboard Coast Line Railroads) corridor from the Northeast to Yemassee, South Carolina, where they turn westward through Augusta, Georgia and on to Atlanta.

1.2.1 *Current Strategies*

CSX has targeted the I-95 corridor for intermodal growth, but currently lacks double-stack clearances along the length of the route.

Obstructions on the line exist in the form of two tunnels: one in Washington, DC at Virginia Avenue, and one in Baltimore, Maryland at Howard Street. Both tunnels are located in densely populated urban areas and thus are difficult to improve or circumvent. There are several other clearance obstructions exist around Philadelphia, Pennsylvania such as overhead catenary wires, highway bridges, and railroad overpasses. The total cost of relieving these obstructions thus far has been prohibitive. Currently, all trains operating on CSX lines along the I-95 corridor are TOFC or single-stack domestic and international containers. Double stacking of trash containers (2/3 height containers) does occur on the CSX lines, giving the appearance of double-stack operations along the I-95 corridor.

Much of CSX Intermodal strategy has focused on high-revenue and high-volume East-West traffic flows. With the capture of several transcontinental movements through Pacer Stacktrain (formerly APL Stacktrain), much of CSX's terminal and equipment capacity is consumed in servicing these lanes. As a result, a second pair of intermodal trains operating from Atlanta to the Northeast was withdrawn to provide terminal capacity for the preferred East-West Traffic.

South of Jacksonville, Florida, CSX operates a number of intermodal feeder trains, connecting Orlando, Tampa and Miami to the Northeast. These trains connect to the through trains outlined above to provide truck – competitive rail intermodal service between Eastern Florida and the Northeast states.

1.2.2 *Conclusions*

While CSX desires to grow traffic along the I-95 corridor, limited capacity in existing terminals along the route reduces the likelihood that such expansion will be significant. Although CSX continues to seek funding for clearance improvements along the corridor, it will for the foreseeable future be unable to obtain the economies of double-stack service. In the competition for scarce railroad resources, the lower margin, single-stack services along the coast have difficulty competing against long haul, high-margin, double-stack transcontinental traffic.

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THE NORTHEAST – SOUTHEAST – MIDWEST CORRIDOR MARKETING STUDY

APPENDIX 6

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Intermodal Technologies and Operations

1. Background

Current NS and CSX intermodal product offerings can be segmented by type of service. The two types of service that exist in the north-south corridor through Virginia are double stack container service and TOFC, with single stack COFC service, although all three services may be intermixed on the same train. Other intermodal products that are available and could be used in the corridor include RoadRailer, Expressway, and the European Ferry Model.

2. Double Stack Container Service

Double stack container technology [Figure A6.1] was introduced in 1977 by the Southern Pacific Railroad and Sea-Land Services in order to achieve the economic benefits of operating more containers per train in mini-land bridge service between Los Angeles and Houston. Although domestic containerization has been introduced in subsequent years, the majority of NS and CSX double stack container traffic in the north-south Corridor through Virginia continues to be maritime traffic. Traffic flows move largely to or from the maritime-oriented facilities located in New Jersey at Expressway, E-Rail, and APL. As shown in Figure A6.3, double stack container traffic comprises 19% of total intermodal traffic in the north/south corridor.

Although there are significant economic benefits from operating trains loaded with double stack container service instead of single stack containers, the principal disadvantages of double stack container technology are the additional terminal time required to stack and tie down the containers and the larger volumes necessary in order to make up double stack trains. Thus, the service is most appropriately offered where large origin/destination and long haul traffic flows exist.

Double Stack Container Technology

Figure A6.1

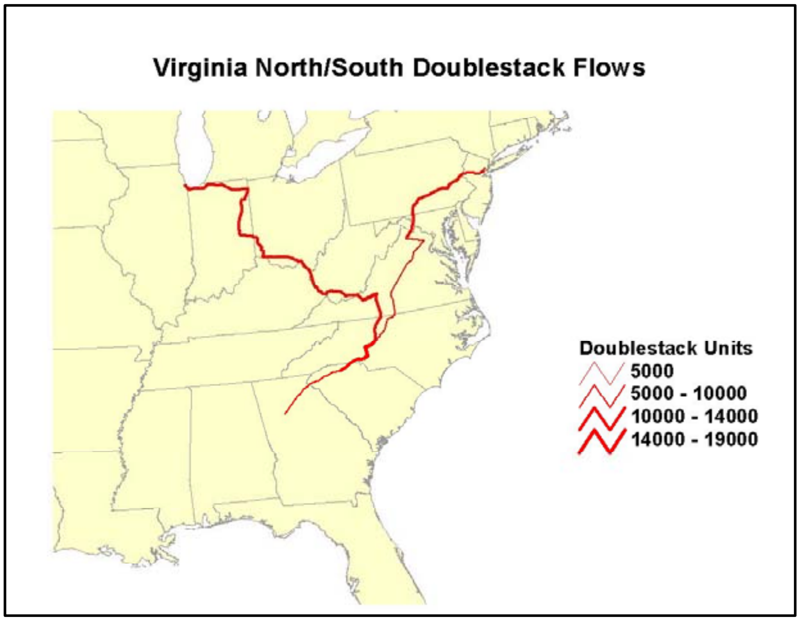


Figure A6. 2

Equipment Distribution of Virginia North-South Rail Traffic 2001

Origin	Destination	TOFC/ COFC Units	Double-stack Units	Total	TOFC COFC Share	Double-stack Share
New York, NY	Jacksonville, FL	13,680	880	14,560	94%	6%
Washington, DC	Atlanta, GA	13,400	360	13,760	97%	3%
Chicago, IL	Greensboro, NC	13,040	680	13,720	95%	5%
Atlanta, GA	New York, NY	8,720	3,400	12,120	72%	28%
Greensboro, NC	Chicago, IL	10,600	680	11,280	94%	6%
New York, NY	Atlanta, GA	8,720	1,160	9,880	88%	12%
Detroit, MI	Norfolk, VA	2,280	5,640	7,920	29%	71%
Jacksonville, FL	New York, NY	6,600	400	7,000	94%	6%
Charlotte, NC	Chicago, IL	2,000	4,840	6,840	29%	71%
Norfolk, VA	Detroit, MI	1,600	4,760	6,360	25%	75%
Washington, DC	Jacksonville, FL	6,160	120	6,280	98%	2%
New York, NY	Miami, FL	4,840	440	5,280	92%	8%
Memphis, TN	New York, NY	2,680	2,080	4,760	56%	44%
Miami, FL	New York, NY	4,600	120	4,720	97%	3%
Jacksonville, FL	Washington, DC	4,480	40	4,520	99%	1%
Chicago, IL	Charlotte, NC	1,720	2,760	4,480	38%	62%

Origin	Destination	TOFC/ COFC Units	Double-stack Units	Total	TOFC COFC Share	Double-stack Share
Jacksonville, FL	Philadelphia, PA	3,360	40	3,400	99%	1%
Philadelphia, PA	Jacksonville, FL	2,880	120	3,000	96%	4%
Washington, DC	Miami, FL	2,840	160	3,000	95%	5%
Philadelphia, PA	Orlando, FL	2,720	40	2,760	99%	1%
Philadelphia, PA	Miami, FL	2,560	120	2,680	96%	4%
Memphis, TN	Harrisburg, PA	1,840	720	2,560	72%	28%
Savannah, GA	Philadelphia, PA	2,320	120	2,440	95%	5%
Charleston, SC	Chicago, IL	400	1,840	2,240	18%	82%
Jacksonville, FL	Boston, MA	1,920	120	2,040	94%	6%
Miami, FL	Philadelphia, PA	1,720	160	1,880	91%	9%
Greensboro, NC	New York, NY	1,760	80	1,840	96%	4%
Washington, DC	Tampa, FL	1,680	-	1,680	100%	0%
New York, NY	Savannah, GA	1,520	80	1,600	95%	5%
Boston, MA	Jacksonville, FL	1,480	40	1,520	97%	3%
Charleston, SC	Philadelphia, PA	1,480	-	1,480	100%	0%
Savannah, GA	New York, NY	1,320	120	1,440	92%	8%
Orlando, FL	Philadelphia, PA	1,400	40	1,440	97%	3%
Atlanta, GA	Washington, DC	1,360	80	1,440	94%	6%
New Orleans, LA	Philadelphia, PA	1,360	40	1,400	97%	3%
Mobile, AL	Philadelphia, PA	1,360	-	1,360	100%	0%
Savannah, GA	Boston, MA	1,200	80	1,280	94%	6%
New York, NY	Jackson, MS	240	1040	1,280	19%	81%
Miami, FL	Washington, DC	1,160	120	1,280	91%	9%
Charleston, SC	Washington, DC	960	280	1,240	77%	23%
Washington, DC	Greensboro, NC	1,000	80	1,080	93%	7%
Cincinnati, OH	Charleston, SC	400	680	1,080	37%	63%
New York, NY	Orlando, FL	1,040	40	1,080	96%	4%
Washington, DC	Orlando, FL	960	40	1,000	96%	4%
Chicago, IL	Johnson, City, TN	680	320	1,000	68%	32%
New York, NY	Memphis, TN	400	600	1,000	40%	60%
Philadelphia, PA	Savannah, GA	920	40	960	96%	4%
Savannah, GA	Washington, DC	960	-	960	100%	0%
Boston, MA	Miami, FL	880	80	960	92%	8%
Jacksonville, FL	Cleveland, OH	800	120	920	87%	13%
Dallas, TX	New York, NY	400	520	920	43%	57%
New York, NY	Dallas, TX	240	680	920	26%	74%
Atlanta, GA	Harrisburg, PA	720	120	840	86%	14%
Charleston, SC	New York, NY	680	120	800	85%	15%
Charleston, SC	Boston, MA	800	-	800	100%	0%
Johnson, City, TN	Salt Lake, City, UT	800	-	800	100%	0%

Origin	Destination	TOFC/ COFC Units	Double-stack Units	Total	TOFC COFC Share	Double-stack Share
Jackson, MS	New York, NY	320	480	800	40%	60%
Philadelphia, PA	Tampa, FL	640	-	640	100%	0%
New York, NY	Greensboro, NC	600	-	600	100%	0%
Chicago, IL	Charleston, SC	320	280	600	53%	47%
Syracuse, NY	Jacksonville, FL	560	40	600	93%	7%
Portland, OR	Charlotte, NC	280	320	600	47%	53%
Charlotte, NC	Seattle, WA	520	40	560	93%	7%
New Orleans, LA	New York, NY	520	40	560	93%	7%
New Orleans, LA	Washington, DC	560	-	560	100%	0%
Washington, DC	Dallas, TX	480	-	480	100%	0%
Orlando, FL	New York, NY	440	-	440	100%	0%
New York, NY	Tampa, FL	400	-	400	100%	0%
Cleveland, OH	Miami, FL	360	40	400	90%	10%
Jacksonville, FL	Columbus, OH	240	160	400	60%	40%
Charleston, SC	Cincinnati, OH	80	320	400	20%	80%
Harrisburg, PA	Dallas, TX	360	-	360	100%	0%
Syracuse, NY	Tampa, FL	320	40	360	89%	11%
Jacksonville, FL	Syracuse, NY	320	40	360	89%	11%
Syracuse, NY	Miami, FL	280	40	320	88%	13%
Seattle, WA	Charlotte, NC	160	160	320	50%	50%
Miami, FL	Boston, MA	320	-	320	100%	0%
Tampa, FL	New York, NY	280	-	280	100%	0%
Charlotte, NC	Denver, CO	280	-	280	100%	0%
Washington, DC	Charleston, SC	160	80	240	67%	33%
New York, NY	Charleston, SC	240	-	240	100%	0%
Green Bay, WI	Charlotte, NC	80	160	240	33%	67%
Greensboro, NC	Los Angeles, CA	240	-	240	100%	0%
Kansas, City, MO	Charlotte, NC	40	160	200	20%	80%
Little Rock, AR	New York, NY	80	120	200	40%	60%
Mobile, AL	Washington, DC	200	-	200	100%	0%
Cleveland, OH	Jacksonville, FL	160	40	200	80%	20%
Orlando, FL	Washington, DC	160	40	200	80%	20%
Washington, DC	Mobile, AL	200	-	200	100%	0%
Philadelphia, PA	Mobile, AL	160	40	200	80%	20%
Philadelphia, PA	New Orleans, LA	120	80	200	60%	40%
Syracuse, NY	Orlando, FL	160	-	160	100%	0%
Tampa, FL	Cleveland, OH	160	-	160	100%	0%
New York, NY	New Orleans, LA	120	40	160	75%	25%
Philadelphia, PA	Charleston, SC	160	-	160	100%	0%
Atlanta, GA	Philadelphia, PA	80	80	160	50%	50%
Tampa, FL	Philadelphia, PA	120	-	120	100%	0%
Greensboro, NC	Denver, CO	120	-	120	100%	0%

Origin	Destination	TOFC/ COFC Units	Double-stack Units	Total	TOFC COFC Share	Double-stack Share
Harrisburg, PA	Atlanta, GA	120	-	120	100%	0%
Lexington, KY	San Antonio, TX	80	40	120	67%	33%
Champaign, IL	Charleston, SC	40	80	120	33%	67%
Wilmington, NC	Lexington, KY	120	-	120	100%	0%
San Antonio, TX	New York, NY	80	-	80	100%	0%
Harrisburg, PA	Jacksonville, FL	-	80	80	0%	100%
Cleveland, OH	Tampa, FL	80	-	80	100%	0%
Charlotte, NC	Minneapolis, MN	80	-	80	100%	0%
Portland, OR	Greensboro, NC	80	-	80	100%	0%
Washington, DC	New Orleans, LA	80	-	80	100%	0%
Washington, DC	Wilmington, NC	80	-	80	100%	0%
Greensboro, NC	San Francisco, CA	80	-	80	100%	0%
Washington, DC	Savannah, GA	80	-	80	100%	0%
Casper, WY	Charlotte, NC	40	40	80	50%	50%
Boston, MA	Orlando, FL	80	-	80	100%	0%
Charlotte, NC	Portland, OR	80	-	80	100%	0%
Tampa, FL	Washington, DC	40	-	40	100%	0%
Cleveland, OH	Orlando, FL	40	-	40	100%	0%
Orlando, FL	Cleveland, OH	40	-	40	100%	0%
Charlotte, NC	Spokane, WA	40	-	40	100%	0%
Boston, MA	Tampa, FL	40	-	40	100%	0%
Spokane, WA	Charlotte, NC	40	-	40	100%	0%
Pittsburgh, PA	Greensboro, NC	40	-	40	100%	0%
Miami, FL	Cleveland, OH	40	-	40	100%	0%
Charleston, SC	Columbus, OH	-	40	40	0%	100%
Minneapolis, MN	Charlotte, NC	-	40	40	0%	100%
Philadelphia, PA	Atlanta, GA	40	-	40	100%	0%
Orlando, FL	Boston, MA	40	-	40	100%	0%
Greenville, SC	Philadelphia, PA	40	-	40	100%	0%
Denver, CO	Greensboro, NC	40	-	40	100%	0%
Salt Lake, City, UT	Charlotte, NC	-	40	40	0%	100%
Cincinnati, OH	Greensboro, NC	40	-	40	100%	0%
Total		**170,760**	**40,440**	**211,200**	**81%**	**19%**
Source: STB Carload Waybill Sample 2001						

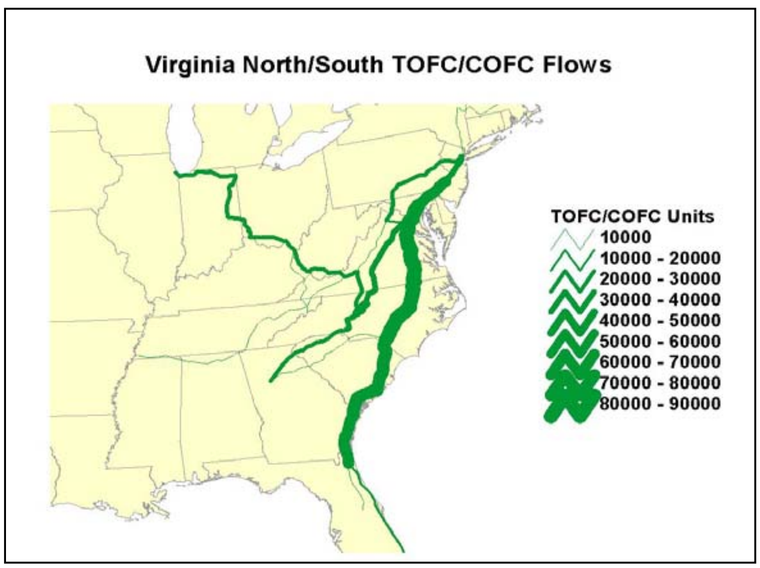
Figure A6.3

3. TOFC/COFC Service

The more generalized intermodal service available in the marketplace through NS and CSX is single unit TOFC/COFC service. As shown by Figure A6.3 this traffic comprises 81% of the total of volume moving in the north-south corridor through Virginia. Primary users include manufacturing, retailing and distribution companies, large trucking companies, postal and express shippers, third party forwarders and smaller maritime users.

4. Other Technologies

4.1 RoadRailer



The RoadRailer technology was introduced to the US railroads by Robert Reebie, a consultant and the founder of Reebie Associates. RoadRailer technology is a "car-less" technology that utilizes a separate rail bogie (truck) to convert a highway trailer to rail service. A primary advantage of RoadRailer is the short terminal time required to convert either from the rail to highway mode or from the highway to rail mode. Conversely a major drawback of this car-less technology is its high initial capital cost and its need to operate in trains dedicated exclusively to handling RoadRailers.

Through its Triple Crown subsidiary, Norfolk Southern operates approximately 85 trains per week among a network of terminals located in Atlanta; Chicago; Dallas/Fort Worth; Detroit; Fort Wayne; Harrisburg, PA.; Jacksonville, FL.; Kansas City; Newark, N.J.; St. Louis; Sandusky, OH; and Toronto[10]. Principal users of the Triple Crown network include auto companies, auto parts suppliers, and other firms that have concentrated, repetitive, and high volume product flows in the same corridor. The Triple Crown equipment is unlike conventional Trailer-On-Flat-Car (TOFC) or Container-On-Flat-Car (COFC) operations in that the trailers are themselves the body of the railcar. The RoadRailer trailer operates over the highway as a conventional trailer and then attaches to a rail "bogie"[11]. Trailers are converted from road to rail operation using an air-ride suspension system. This system minimizes the infrastructure demands at the terminal site: no crane or lift equipment is necessary. The RoadRailer system provides a truck competitive, damage-free transportation product, using only about half the locomotive power and fuel of conventional piggyback trains[12]. At present, there are no RoadRailers operated in the north/south traffic lanes through Virginia.

Because of the high cost of the lift equipment essential to conventional rail intermodal operation, railroads traditionally eschew markets that do not generate 40,000 "lifts"[13] per year. The cost of new terminal construction is approximately $250,000 per acre (not including land acquisition costs), with most recent terminals consuming in excess of 200

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[10] http://www.triplecrownsvc.com

[11] The RoadRailer bogie is a rail "truck" assembly consisting of two wheel sets linked by a bolster assembly. It is similar in design to a single conventional railcar truck assembly.

[12] http://www.triplecrownsvc.com

[13] A "lift" is the term used to describe the "taking-off" or "putting-on" a trailer or container to/from a railcar in conventional intermodal operations. The annual tally of lifts generally counts a lift-off and a lift-on as a single "lift".

acres. Thus conventional intermodal terminal economics requires a $7,500,000 investment and approximately 130 trailers of freight *in each direction per day* to break-even. Conversely, RoadRailer operations have a much-lower break-even point. Terminal construction costs average between $70,000 and $150,000 per acre, and can be erected on as little as 50 to 60 acres[14].

4.2 Expressway

Expressway is an intermodal system, including a unique technology, that was developed to provide short-to-medium-haul rail transportation service that would be attractive to motor carriers. Expressway is owned and operated exclusively by the Canadian Pacific Railway (CPR). Expressway currently serves five stations with hubs at Toronto, Montreal, and Detroit, in a linear corridor of about 560 miles. However, Expressway intends to extend its service to Chicago in 2003, thereby increasing its total corridor length to about 770 miles.

According to CPR, Expressway is a truck-like intermodal transportation system designed to handle **standard, non-reinforced highway trailers** in the short-to-medium-haul market, with the following key characteristics:

- Expressway rail cars combine high-ride quality with flexible loading (using a drive-on and drive-off ramp system);
- Expressway offers easy to use automated reservations and terminal check-in; and,
- Expressway operates dedicated trains between dedicated terminals.

Also, according to CPR, Expressway was designed as a means for that railway to participate in short-to medium-haul markets by providing a lower operating cost system for motor carriers.

CPR believes that there is a market niche for an efficient line haul rail service designed specifically for such short-haul markets in heavy truck lanes, to be operated in partnership with motor carriers. CPR sets forth the following requirements to successfully serve that market niche:

- Consistent, market-driven train schedules;

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[14] While both conventional and RoadRailer terminals have similar lighting, fencing, and administration facility needs, the paving at conventional intermodal facilities must be substantially thicker to accommodate the heavy weight of trailer and container lift equipment.

- Close access to key roadway links for terminals;
- Safely handles non-reinforced trailers without damaging to contents; and
- Reduction in the overall costs of transportation of the motor carriers and their customers.

Expressway states that it provides a consistent, market-driven scheduled line haul service with competitive transit times, 99% reliability, and high productivity:

- Each corridor has four train starts a day, two in each direction, with up to 90 platforms per train;
- Dedicated train and power; and
- Truck comparable transit times.

Although CPR would like increased train frequency of up to 4-6 train starts per direction, per day, line capacity limitations have precluded such an expansion of Expressway service.

Dedicated Expressway terminals are located close to markets and the highway system, and have efficient and simplified operating procedures:

- Purpose built terminals;
- Handling operations average under 5 minutes per trailer;
- Trucks achieve throughput times of 15 minutes or less; and
- Terminals are open for pick-up delivery 24/7.

Expressway’s unique railcar technology is said to provide superior ride quality with an integral loading system:

- Cars have excellent ride quality and minimal “slack” action; and
- Each platform can handle any type of trailer.

Expressway’s information system uses a centralized control system that was designed specifically for Expressway:

- The entire business process is driven from the initial data entry from the automated reservation system; and

- The system provides an integral customs application for cross-border shipments.

Expressway is oriented to be a partner to the trucking industry, not a competitor. Its pricing reflects a lower operating cost system that encourages profitable growth for all stakeholders. Expressway sees the following advantages for its motor carrier partners:

- Lower cost operations:
  - Improved margins and/or competitiveness; and
  - Extended savings with added capacity and network growth.
- Maintain or improve service:
  - Service reliability, reserved slots; and
  - Line haul not impacted by border or highway congestion.
- Capacity to Grow
- Grow business with less capital, particularly for over-the-road tractors; and
- Address driver shortage, home terminal operations.
- Safety:
  - Fewer road miles equal fewer accidents.

CPR was successful in attracting 60,000 trailers in 2001, with continuing growth in 2002, and projected for 2003. Customers are pure motor carriers, fleet owners, and truckers who support the automotive industry's just-in-time parts needs. CPR puts its current market share of the total market at 2-2.5%, with a maximum potential of 12-15% without capacity expansions. However, with significant capacity increases, CPR projects a possible market share as large as 33% of the total market.

From our perspective, an Expressway-like system provides a rail intermodal product that should be attractive in multiple, heavy truck lanes, including conversion of the significant amount of traffic in the 600-900 mile range from the Deep South and the mid-south to the northeast region that has been identified by this Market Study.

4.3 Rolling Highway

A relative to the Expressway concept is the Rolling Highway used across Switzerland and Austria, as well as in the English Channel Tunnel. Using equipment similar to Expressway, complete tractor and trailer sets are carried on the train. In the longer Alp crossings, a separate sleeping car is provided for the drivers.

The advantages of these services include:

- Equipment and driver stay together, no need to arrange for dray services or schedule pick-up or drop-off at the ramps.
- Fast loading and unloading, no shuffling back and forth with a yard tractor to bring each trailer on board, each driver just follows the previous truck.
- Security, the driver stays with or near the load.
- Driver is making progress toward destination, while resting at the same time.
- Can be mixed with other services, such as Expressway or passenger services.
- Can carry any type of highway equipment, including straight trucks.
- Safety.

However, the service has significant disadvantages as well:

- Schedule, if frequencies and speeds are insufficient, the cost of waiting for the driver and tractor can be significant;
- Low load to tare ratio, for each load there is a significant dead weight in tractor, flat car, rider sleeper, and locomotive;
- Clearance, not a problem in the United States, but solutions to fit a trailer on top of a flat car within smaller European clearances have led to the use of eight axle flat cars with very small wheels, consequently, with high maintenance costs.

4.3.1 Application

The most successful applications of Rolling Highway have been across the Alps. Several factors contribute to the competitiveness of the service:

- The Swiss mileage and weight charges;[15]
- Difficult terrain;
- High volume corridor.

There are currently four crossings each day in each direction. Pricing information obtained from the operator does give a crude approximation of costs. For example, Singen (near Stuttgart) to Milan is 334 miles, with a fare of EUR 445 (USD 476)[16].

Another example of Rolling Highway technology can be found in Ökombi, the Austrian intermodal company, which maintains a network of Rolling Highway services into and out of the country shown in Figure A6.4.[17]

Figure A6.4

[15] Heavy Vehicle Fee, http://www.tradeport.org/ts/countries/switzerland/mrr/mark0017.html.

[16] March 27, 2003 Exchange rate, Yahoo! Finance, http://finance.yahoo.com/q?s=EURUSD=X&d=c.

[17] Rollende Landstraße, http://www.oekombi.at/2_rola/2_txt_a0.html.

4.3.2 Market Acceptance

While it is an established service across the Alps, overnight Rolling Highway (as opposed to short haul tunnel crossings) has not had great success elsewhere. An experimental service in Sweden (Strömstad-Trelleborg), while showing theoretical promise[18], was abandoned after six months for insufficient volume.

In Europe, there are a numerous overnight ferry services, many with alternative land or land-short ferry alternatives. While many handle unaccompanied trailers, the larger flow is complete trucks with drivers. A ferry is able to offer significantly more amenities than a single sleeping car (full restaurants, slot machines, shopping), and thus is closer to a rolling truck stop in nature.

The closest U. S. model is Amtrak's Auto Train for passenger autos and their drivers and passengers, operating between Lorton, VA, and Sanford, FL. However, since no similar services for trucks exist in the U. S., it is difficult to judge the potential level of acceptance, especially among the smaller companies and independent operators to whom the service is likely to appeal.

However, to attract the segment of the truck market that consists of independent and small operators, a service that keeps truck, trailer, and driver together is almost a requirement. A service that is similar in cost to driving, reasonably frequent, offers travel times that are consistent with rest requirements, would be almost certain to attract some of this traffic. The competitive environment would then begin to demand the expedited travel times that 'moving rest' would offer.

Optimal services would allow a driver to put in a full shift of driving, and then get the required rest. This could be accomplished not only by providing terminals one day from major traffic centers, but also terminals that allow a driver to leave the terminal, deliver or unload, pick up or load, and return to the terminal during one work period.

18 Björn Bryne and Daniel Ljunghill, Rullande Landsväg för transittrafik Norge-Kontinenten, Royal Institute of Technology, Stockholm, Sweden 1995.

4.4 Other Models

A small amount of freight moves through Virginia as express shipments on Amtrak, either carried in RoadRailer equipment, or in boxcars. Prior to Southern Railway turning over its passenger service to Amtrak, some of Southern Railway's passenger trains on the Piedmont route were combined with intermodal service, leaving Washington with a few passenger cars, and adding intermodal cars on the rear of the train in Alexandria. At current levels of passenger service through Virginia, any such combination of service is unlikely to have a noticeable impact on truck traffic.

5. Conclusions

While some portion of the available volume will likely never be diverted to rail intermodal service, the availability of a menu of service and technology alternatives provides the greatest opportunity for highway to rail diversion across the segmented motor carrier market. Currently, only 53% of the highway traffic in the I-81 fits the traffic that is divertable to current (conventional) rail intermodal service. With the addition of Expressway and Rolling Highway technologies to an improved conventional rail intermodal product, rail intermodal services can theoretically compete for all non-hazardous freight.[19] Thus the potential for significant diversions is increased, as only modest market penetration in these massive (small and medium) truck segments provides substantial modal shift.

6. Current Rail Operations in the I-81 Corridor

Current rail operations in the corridor are provided by two Class I railroads, Norfolk Southern Railway Company ("NS") and CSX Transportation, Inc. ("CSX"). Since the 1999 split-up of Conrail between these two carriers, both NS and CSX provide single system service between major origins and destinations in the Northeast and Southeast regions.

Figure A6.5 shows major highway tonnage flows through Virginia. This data suggests that the largest highway tonnage flows through Virginia are between the Memphis Gateway, New Orleans Gateway, Jacksonville, FL and the Northeast region. The Memphis-Northeast region highway tonnage flow is via I-40 from Memphis to a point near Knoxville, and then via I-81 through Virginia. Similarly, the New Orleans-Northeast region highway tonnage flow is via I-59 and I-75 to a point near Knoxville, and then via I-81 to the Northeast region. Within the Northeast region, traffic disperses to or

[19] Reebie TRANSEARCH, traffic through Virginia using 20 miles or more of I-81, dry van trucks over 500 miles haul as a share of all loaded trucks.

aggregates from Harrisburg, Philadelphia, New Jersey, and beyond. In general, the NS System parallels the highway network in all of these markets.

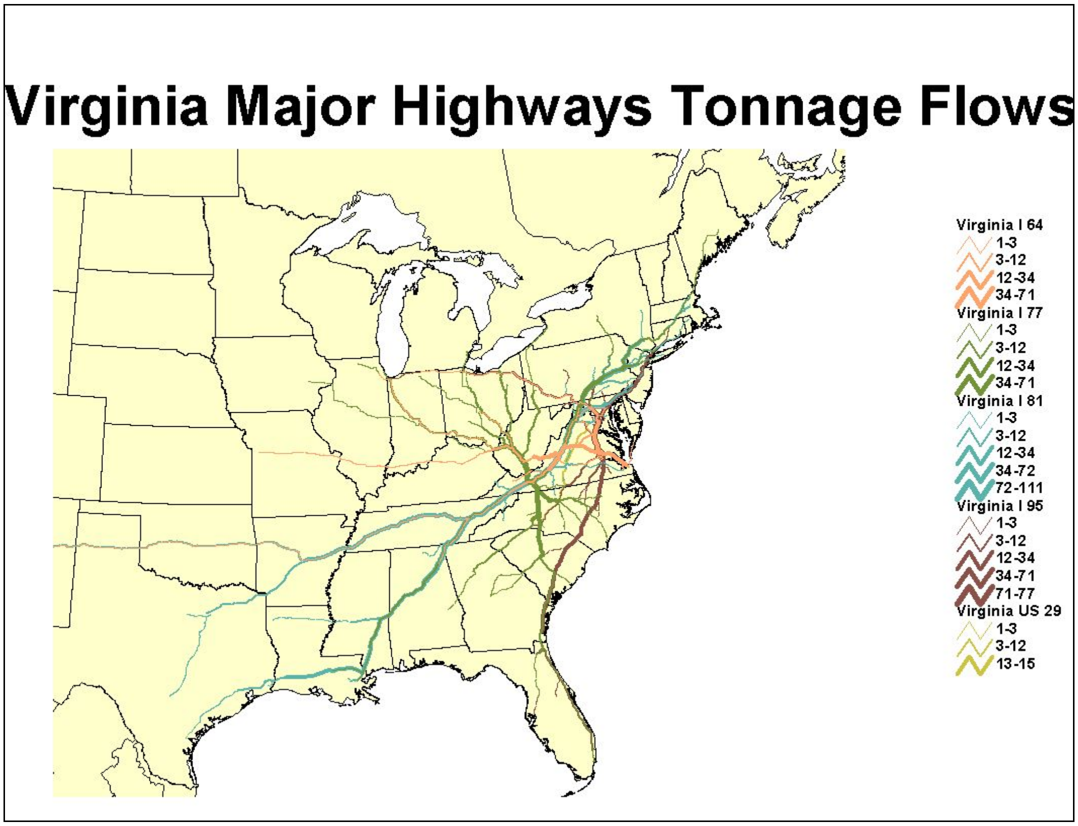

Figure A6.5

Figure A6.5 also shows a significant flow of highway tonnage on I-77 through Virginia, a large portion of which combines with the I-81 Corridor flow to and/from the Northeast region. Primary concentration points on I-77 in the Southeast Region are Columbia, Charlotte, and Greensboro. The NS System also parallels I-77.

Figure A6.5 also shows a significant flow of highway tonnage on I-95 between Jacksonville and the Northeast region. At Richmond, the I-95 flow is supplemented by traffic to and from I-64 that primarily originates or terminates in the Hampton Roads/Newport News/ Norfolk area. In combination, these highway tonnage flows extend to Baltimore, Philadelphia, New Jersey, and other points in the Northeast region. The CSX System generally parallels the highway network in all of these markets.

6.1 Norfolk Southern

Figure A6.6 shows the locations of the relevant interstate highway and NS railroad networks, between Atlanta in the south and Harrisburg and Philadelphia on the north. As shown by Figure A6.6, NS's rail lines generally parallel the major highway tonnage flows in the I-81 corridor and I-77 corridors. Note that NS can also serve the I-95 corridor by route extensions south of Columbia to points near Savannah and/or Charleston, albeit with greater route circuity than that of the CSX system.

Two of NS's primary rail routes have been considered in this Study, both of which are shown with the relevant interstate highways in Figure A6.6. The first, NS's Shenandoah Route, is defined generally as being located between Harrisburg (and points north) through Hagerstown, Roanoke, and Knoxville to Atlanta. NS's second primary route, its Piedmont Route, extends generally from Harrisburg (and points north) to Hagerstown, Manassas, Greensboro, Charlotte, Spartanburg, and Greenville to Atlanta.

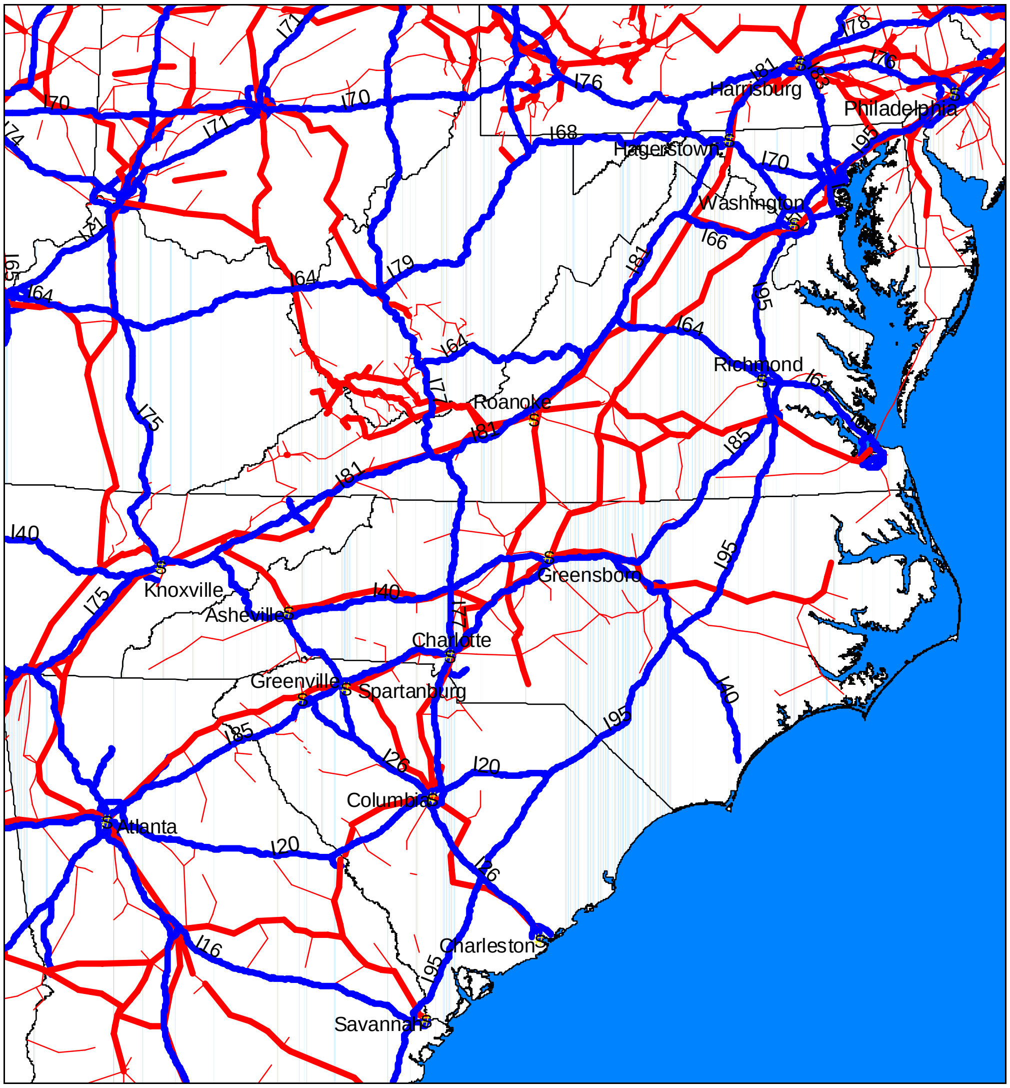

Figure A6.6

Potentially, NS could extend its Piedmont Route into the Northeast region from Alexandria, Virginia via the Northeast Corridor ("NEC") whose rail lines it has the right to use. At present, however, NS does not operate any through trains in the NEC because of operating, maintenance, and capacity constraints imposed by Amtrak.

7. Description of the Physical Routes

7.1 Shenandoah Route

NS's Shenandoah Route between the Northeast region Harrisburg, and Hagerstown uses former Conrail lines. While Norfolk Southern's traditional Shenandoah Route utilizes former N&W rails between Hagerstown and Bristol, this analysis studied a “Modified Shenandoah Route” [20] that uses the former N&W line to Riverton Junction, thence former Southern Railway tracks to Manassas, Lynchburg and Roanoke, where the Route rejoins the former N&W route (the traditional Shenandoah Route) south to Bristol. The line Beyond Bristol, the Shenandoah Route uses former Southern Railway lines to Knoxville and Atlanta. Much of the Shenandoah Route has significant curvature and grades as it traverses the foothills of both the Appalachian and the Blue Ridge Mountains.

Figure A6.7 shows a map of NS’s Shenandoah Route between Harrisburg and Atlanta. NS’s Shenandoah Route could connect existing, large intermodal hubs in Harrisburg and Atlanta. The Route is sufficiently long that, if significantly upgraded, it would be suitable for conventional TOFC/TOFC service. Moreover, all or portions of the Route could be used for an Expressway-like service, if terminal space were available.

[20] Using Norfolk Southern’s earlier investment analysis of the Shenandoah Route as a guide, this analysis considered and then utilized a modification to the earlier routings contemplated for I-81 traffic diversions. Instead of routing traffic north from Roanoke to Riverton Junction, the “Modified Shenandoah Route” bypassed the most costly portion of the original Shenandoah Route by diverting from Riverton Junction to Roanoke where it rejoins the original Shenandoah Route. This adjustment was made for the diversion analyses, but the characteristics of the line outlined in this section reflect the traditional path of the Shenandoah Route and not the modified version.

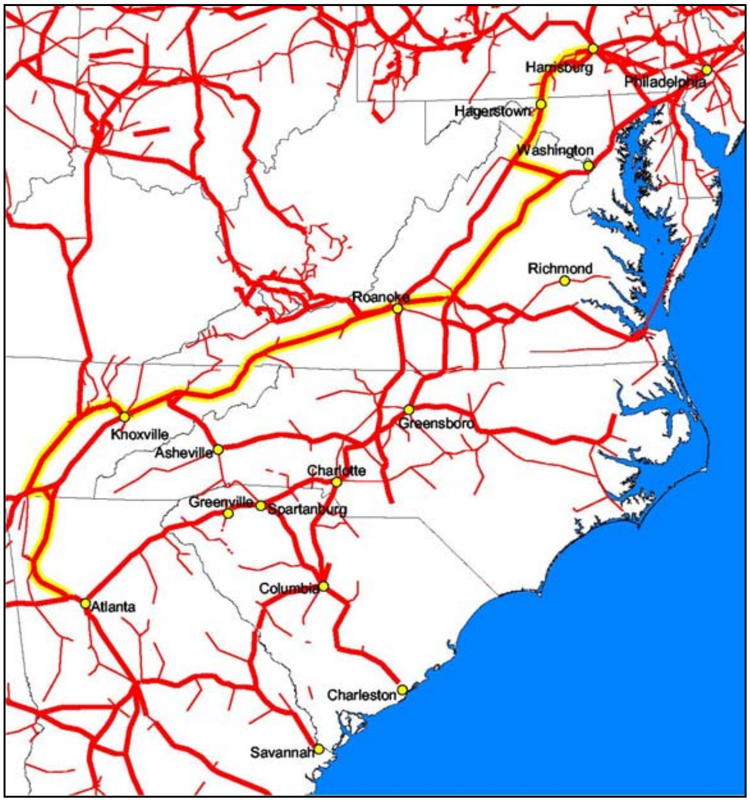

Figure A6.8

Figure A6.9 shows selected operating characteristic of NS's Shenandoah Route as derived from its Operating Timetables:

- The Route is 832 miles long;
- Train Control applies to 570 miles, or about 69% of the total Route; however the remaining 31% of the Route does not have signals;
- Except for 37.8 miles of double track, the Route has only one main track;

Maximum current zone speeds for passenger and intermodal train service are 60 mph, but much 50 mph maximum speed territory exists. In addition, there are numerous speed restrictions south of Hagerstown that often restrict speeds to 25 mph or lower.

In our opinion, because of its mountainous location, even if it were upgraded, NS's Shenandoah Route could not produce average intermodal train speeds in excess of 45 mph, and its maximum authorized speeds could probably not exceed their current 60 mph maximum authorized speeds at most locations.

Selected Operating Characteristics of NS Shenandoah Route Harrisburg, PA - Atlanta, GA via Knoxville				
	Miles	**Tracks**	**Method of Operations**	**Max. Authorized Zone Speeds PX/IM**
Harrisburg-Hagerstown				
CP Capital-CP Ship	40.4	1	TC	50
CP Ship-Hager	34.4	1	TWC	50
Subtotal	**74.8**			
Hagerstown-Bristol				
Hagerstown-Roanoke	259.8	1	TC	50
Roanoke-Walton	37.8	2	TC	50
Walton-Bristol	110.7	1	TC	60/60
Subtotal	**408.3**			
Bristol-Austell				
Bristol-Cleveland	212.7	1	TWC	60
Cleveland-Cohutta	14.5	1	TWC	35
Cohutta-Inman Yard	121.5	1	TC	60/60
Subtotal	**348.7**			
Total	**831.8**			

Notes:

(1) **Data from NS Timetables**

(2) **TC means Train Control**

(3) **TWC means Train Warrant Control**

Figure A6.9

7.2 Piedmont Route

NS's Piedmont Route between the Northeast region, Harrisburg, and Hagerstown also uses former Conrail lines. South of Hagerstown to Front Royal, the route uses NS's former N&W line. From Front Royal to Manassas, the Piedmont Route utilizes a former Southern Railway branch line. South of Manassas, the Piedmont Route runs via the former Southern Railway main line to Greensboro, Charlotte, Greenville, and Atlanta. Figure A6.10 shows a map of NS's Piedmont Route between Harrisburg and Atlanta.

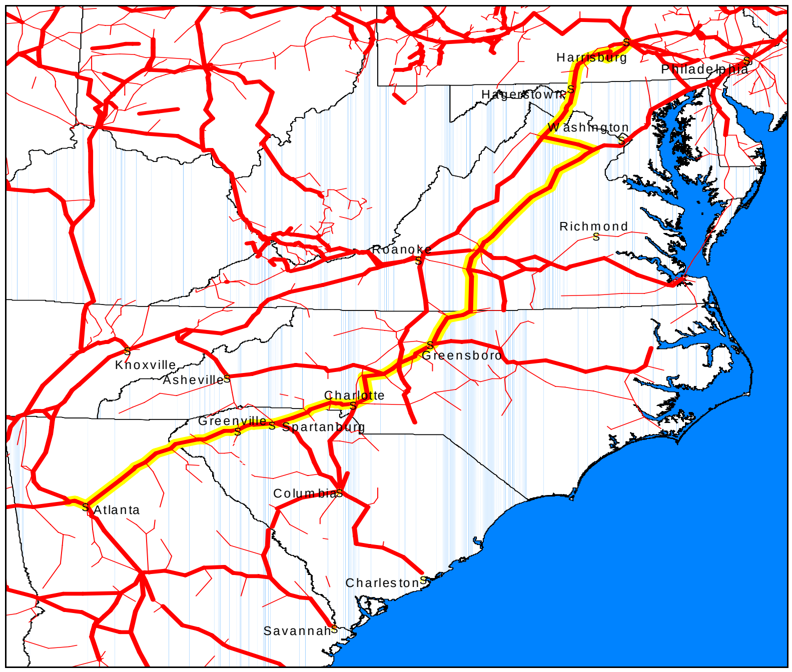

Figure A6.10

The Piedmont Route is used to connect NS's existing large intermodal hubs in Harrisburg and Atlanta. This Route is sufficiently long that it is now used for conventional TOFC/TOFC service. Moreover, all or portions of the Route could be used for an Expressway-like service if terminal space were available.

Figure A6.11 shows selected operating characteristics of NS's Piedmont Route as derived from its operating timetables:

- The Route is 788 miles long;
- The Route alternates between one and two main tracks for most of the 604 miles between Manassas and Atlanta; however, north of Manassas for 183.9 miles, or about 23% of the total Route, the Route has only one main track;
- Train Control applies to 703 miles, or about 89% of the total Route, but the remaining 11% of the Route does not have signals.

As shown by Figure A6.11, the Piedmont Route's maximum current zone speeds for passenger and intermodal service are 79 mph and 60 mph, respectively, for the 604 miles between Manassas and Atlanta. Despite many speed restrictions because of curvature, running speeds without stops Amtrak Trains Nos. 19 and 20 average about 50 mph over the Piedmont Route between Alexandria and Atlanta. North of Manassas to Hagerstown, maximum authorized zone speeds for passenger and intermodal train service are 45-50 mph, also with numerous speed restrictions. Because of its superior location however, we are of the opinion that if it were upgraded, NS's Piedmont Route could produce average intermodal train speeds of approximately 50-60 mph with maximum authorized speeds of 79 mph.

Selected Operating Characteristics of NS Piedmont Route

Harrisburg, PA - Atlanta, GA via Manassas

	Miles	**Tracks**	**Method of Operations**	**Max. Authorized Zone Speeds PX/IM**
Harrisburg-Hagerstown				
CP Capital-CP Ship	40.4	1	TC	50
CP Ship-Hager	34.4	1	TWC	50
Subtotal	**74.8**			
Hagerstown-Manassas				
Hagerstown-Riverton	58.2	1	TC	50
Riverton-Manassas	50.9	1	TWC	45/45
Subtotal	**109.1**			

Selected Operating Characteristics of NS Piedmont Route Harrisburg, PA - Atlanta, GA via Manassas				
	Miles	**Tracks**	**Method of Operations**	**Max. Authorized Zone Speeds PX/IM**
Manassas-Atlanta				
Manassas-Montview	142.0	1-2	TC	79/60
Montview-Salisbury	158.7	1-2	TC	79/60
Salisbury-Greenville	150.8	1-2	TC	79/60
Greenville-Inman Yard	152.4	1-2	TC	79/60
Subtotal	**603.9**			
Total	**787.8**			

Notes:
(1) Data from NS Timetables
(2) TC means Train Control
(3) TWC means Train Warrant Control

Figure A6.11

7.2.1 ***Existing Intermodal Service On The NS Routes***

Between Harrisburg and Atlanta, NS operates the following intermodal facilities that are located on either the Shenandoah or Piedmont Routes:

- Atlanta, GA;
- Charlotte, NC;
- Greensboro, NC;
- Front Royal, VA; and
- Harrisburg, PA.

North of Harrisburg, NS operates three intermodal facilities in the large New Jersey market as well as intermodal facilities in Bethlehem, Morrisville, Taylor, and Philadelphia, PA.

Between Atlanta and the Northeast region, NS offers through intermodal service only on the Piedmont Route. Premium COFC/TOFC service is provided by a single through train operating over the Piedmont Route between Atlanta, Harrisburg, and Croxton, NJ, NS's primary terminal in the New Jersey area.

Principal users include postal and express, third party, trucking and some maritime companies.

Trains between Memphis and Atlanta provide connecting traffic to this premium Piedmont Route train. Although NS believes that there is significant traffic potential for highway diversion to intermodal service through the Meridian, MS Gateway that would be preferred to its current use of the Memphis Gateway, Kansas City Southern Railway's (KCS) unreliable service has prohibited the development of this traffic.

NS's premium intermodal train schedules between Atlanta and Croxton are about 29.5 hours over the 969-mile route in either direction, including a one-hour stop at Greensboro to pick-up and set-out traffic. Between Croxton, NJ and Atlanta, GA, their average speeds are about 34 mph. North of Manassas, however, average train speeds are a slower-than-average 29 mph, while south of Manassas to Atlanta, average train speeds are a higher- than-average 39 mph.

Elsewhere on the Piedmont Route, NS operates a pair of intermodal trains between Atlanta, GA and Alexandria, VA primarily for UPS traffic. NS also operates a pair of trains between Atlanta, GA and E-Rail, NJ that handle primarily maritime traffic on schedules that are about 10% longer than its Atlanta-Croxton schedules. Another pair of NS intermodal trains operates between Norfolk and Detroit, using a portion of the Piedmont Route between Lynchburg, VA and Harrisburg, PA. Other intermodal services operate over a portion of the Piedmont Route between Lynchburg, VA and the Virginia Inland Port near Front Royal, VA.

NS's Piedmont Route trains have experienced significant growth since NS's absorption of its portion of Conrail, and NS projects continuing growth in future years. According to NS, north/south traffic growth has been among the fastest segments of total NS intermodal traffic and represents a substantial portion of the firm's targeted long-term growth. As a result, NS projects the addition of one pair of intermodal trains on the Piedmont Route within the next five years, and the addition of two more pairs of intermodal trains within the next ten years.

It is also NS's objective to add one intermodal TOFC train in each direction north of Alexandria, VA in the NEC, and NS states that negotiations are underway with Amtrak and SEPTA (Southeastern Pennsylvania Transportation Authority) to permit such service to occur. If successful, we estimate that NS's train schedules between Atlanta, GA and Croxton, NJ could be reduced by some four to six hours, or between 15% and 20%. Note however, that the NEC is not double stack cleared, and cannot be cleared, so that intermodal train service in the NEC will always be restricted to TOFC service only.

Although NS has used portions of the Shenandoah Route for intermodal service in previous years, its slower allowable speeds have caused all intermodal trains to be shifted away to the Piedmont Route and others at this time. There is no change projected in this NS policy.

7.2.2 Application to the Market Study and Diversion Model

Rail-highway competition is usually expressed in terms of the transit times, reliability, and cost of the two modes. Reliability and cost differentials between the two modes have been addressed in the interview and survey portions of this Market Study, as well as in the Diversion Model.

- With regard to transit time, we found that the average speed of NS's premium intermodal train schedule between Atlanta and Croxton is about 34 mph, performance that is some 11 mph lower than the average 45 mph that truckers can achieve on parallel Interstate System highways. Accordingly, for substantial diversion of highway traffic to rail to occur, it is apparent that NS's average train speeds must be increased so that its transit times will be competitive with truck.

- Figure A6.12 shows a comparison of NS and truck transit times by length of haul that would be required in order for NS transit times, including terminal times, to be equal to truck.

- Figure A6.12 accepts truck average speeds of 45 mph, and compares that to NS's current average linehaul speeds of 34 mph, and then adds Expressway-like minimum terminal times of 2.5 hours to the NS linehaul times.

- Figure A6.12, at current average speeds, NS transit time as a percent of truck ranges from a low of 144% and a 9.7 hour disadvantage on a 22.2 hour truck transit time for a 1,000 mile length of haul to a high of 161% and a 5.4 hour disadvantage on an 8.9 hour truck transit time for a 400 mile length of haul.

- In order to determine the linehaul average speeds for NS's total transit time to equate to truck transit time for each length of haul,

- Figure A6.12 also provides terminal and allowable linehaul speeds for NS. As shown by

- Figure A6.12**,** NS's required average linehaul speeds would be as follows:

- For a 400 mile haul, 63 mph
- For a 600 mile haul, 32 mph
- For a 800 mile haul, 34 mph
- For 1,000 mile haul, 28 mph

Comparison of NS and Truck Transit Times

	Length of Haul			
	400 mi	**600 mi**	**800 mi**	**1,000 mi**
Driving Time @ 45 mph	8.9 hr	21.3 hr	25.8 hr	38.2 hr
NS at Current Average Speeds:				
Terminal Time (Min)	2.5 hr	2.5 hr	2.5 hr	2.5 hr
Linehaul @ 34 mph	11.8	17.6	23.5	29.4
Total NS Transit Time	14.3 hr	20.1 hr	26.0 hr	31.9 hr
NS vs. Truck Transit Time:				
Hours NS exceeds Truck	5.4 hr	(1.2) hr	0.2 hr	(6.3) hr
NS as a Percent of Truck	161%	94%	101%	83%
NS at Competitive Average Speeds:				
Terminal Time	2.5 hr	2.5 hr	2.5 hr	2.5 hr
Allowable Linehaul Time	6.4	18.8	23.3	35.7
Required NS Transit Time	8.9 hr	21.3 hr	25.8 hr	38.2 hr
Required Average NS Train Speeds	63 mph	32 mph	34 mph	28 mph

Notes:

(1) Truck Transit Times assume a single driver meeting log requirements for 10 hours driving, 8 hours not driving, and 6 hours driving in any 24-hour period.

(2) Minimum NS Terminal Time of 2.5 hours is based on Expressway's 1.5-hour cut-off time before train departure, and 1.0-hour time before trailer availability after train arrival.

Figure A6.12

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THE NORTHEAST – SOUTHEAST – MIDWEST CORRIDOR MARKETING STUDY

APPENDIX 7

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Needs Assessment

1. Between Northern New Jersey and New Orleans, LA and Between Lynchburg, VA and Memphis, TN

1.1 Summary

As shown by Attachment A, the ranges of estimated costs at year 2002 levels for increasing train speeds and line capacity on the 2,195 miles of NS lines between the Northern New Jersey Shared Assets Area and New Orleans and between Lynchburg, VA, and Memphis, TN are:

- Column A: Reduce curvature and increase train speeds: $355.1-$387.4 million.
- Column B: Phase I, increase line capacity: $1,618.6-$1,765.8 million.
- Column C: Phase II, increase line capacity: $5,485.9-$5,984.6 million.

Following is our explanation of the three categories of costs contained in Columns A, B, and C:

Column A: Estimates of cost to reduce curvature for curves that restrict train speeds below the authorized zone train speeds are included in Column A. The Norfolk Southern "Super-Elevation of Curves for Maximum Speeds" dated March 1991, prescribes the superelevation and spiral lengths for given freight and passenger train speeds which are assumed to be required for all new construction and track modifications. The maximum authorized superelevation is 4 inches for freight and 5 inches for passenger trains. The general range of curves that restrict passenger, intermodal (Rhwy) and freight train speeds is from 4 degrees to 6 degrees. In general, these curves must be reduced to the range of 2 degrees to 3 degrees in order to conform to the Norfolk Southern Railway Company standards and provide Rhwy train speeds of 60 mph. Woodside has recommended such curve reductions where feasible on all of the NS Lines under study.

The estimates of costs in Column A for some curves include minor track shifting, increasing superelevation and lengthening spirals. Other curves located where there are a series of reverse curves with limited reversing tangents require minor to major line changes which may involve some new trackage, extensive grading and, in some cases, purchase of additional right of way.

Column B: This column can be considered as Phase I, for the capacity improvements necessary to handle a substantial increase in MGT in the form of expedited intermodal rail traffic. Signal Systems were improved where necessary, new sidings were located at appropriate spacings and at locations with minimal bridge and grade separation construction. In heavier tonnage territories some sections of double track were connected where spacing is appropriate and construction costs are held to a minimum. In very heavy tonnage territory, triple track was planned.

Column C: This column can be considered as Phase II, for the capacity improvements necessary to handle double to triple the existing rail traffic on the line segment. Where the line segment currently has single track with sidings or single track between stretches of double track, the ultimate build-out becomes double track, bidirectional, Traffic Control, with universal crossovers about every ten (10) miles. Where a current line segment has double track in heavy tonnage territory, a triple track with universal crossovers is planned.

For the most part the estimates rely on the information in the Norfolk Southern Timetables and the current track charts for the various districts under study. The estimates in Column A (reduced curvature to increase train speeds) are not included in Columns B and C. Column B is a stand-alone estimate of proposed Phase I to increase line capacity. Column C is Phase II or the ultimate build-out to maximize line capacity for the anticipated expedited intermodal traffic. Some work detailed in Column C may duplicate work in Column B, but the calculated costs in Column C are made independent of the Column B estimates.

All cost estimates in Columns A, B, and C include both low additives of 6% for engineering and 15% for contingencies, a total of 21%, and high additives of 32%, the latter reflecting the uncertain field conditions underlying our cost estimates. The engineering additive includes designs, specifications, permits, environmental studies and approvals, mitigation and construction management.

Attachment D contains operating abbreviations and definitions that are used in presenting our results.

Attachments E and F provide by state the same Column A, B, and C cost estimates contained in Attachments B and C for the NS Lines between the Northern New Jersey Shared Assets Area and New Orleans and between Lynchburg, VA and Memphis, TN, respectively. As shown in Attachment E, the ranges of estimated costs in Virginia for the 282.5 miles of NS Lines between the Northern New Jersey Shared Assets Areas and New Orleans, LA are:

- Column A: Reduce curvature and increase trains speeds: $39.7-$43.3 million

- Column B: Phase I, increase line capacity: $227.5-$248.3 million.
- Column C: Phase II, increase line capacity: $665.3-$725.7 million.

As shown in Attachment F, the ranges of estimated costs in Virginia for the additional 200.2 miles of NS Lines between Lynchburg, VA and Memphis, TN are:

- Column A: Reduce curvature and increase trains speeds: $32.7-$35.7 million.
- Column B: Phase I, increase line capacity: $132.4-$144.4 million.
- Column C: Phase II, increase line capacity: $262.9-$286.8 million.

In total, as shown by the combination of Attachments E and F, the ranges of estimated costs in Virginia for the 482.7 miles of both NS routes are:

- Column A: Reduce curvature and increase trains speeds: $72.4-$79.0 million.
- Column B: Phase I, increase line capacity: $359.9-$392.7 million.
- Column C: Phase II, increase line capacity: $928.2-$1,012.5 million.

2. Between Northern New Jersey Shared Assets Area and New Orleans

The estimated costs of improving the NS Line between the Northern New Jersey Shared Assets Area and New Orleans are contained in Attachment B to this Appendix. Attachment B is a summary of the districts, route miles and costs for Columns A, B, and C on the entire line. As shown by Attachment B, the ranges of estimated costs for increasing train speeds and line capacity on the NS Line between the Northern New Jersey Shared Assets Area and New Orleans are:

- Column A: Reduce curvature and increase train speeds: $255.4-$278.7 million
- Column B: Phase I, increase line capacity: $1,122.4-$1,224.4 million
- Column C: Phase II, increase line capacity: $3,970.3-$4,331.2 million

Attachments B-1 through B-16 consist of 16 pages with each page representing a district or portion of a district traversed by the route from Manville, New Jersey (the southerly edge of the Northern New Jersey Shared Assets Area) to New Orleans, Louisiana. Each page describes the route miles, current annual million gross tons of traffic over the district, current method of operation, present maximum authorized zone train speeds for passenger, intermodal (Rhwy) and freight trains, and Woodside's recommended improvements and their estimated costs.

There are several locations on the entire route which represent "choke points" that might delay rail traffic. These locations were omitted from Woodside's capacity improvement plans because of their high costs and complexity of construction:

- *Harrisburg* -- CP Capitol to CP Front Street, 0.4 TM of single track on a high line over city streets and 4 railroad tracks.

- *Montview* -- A 2.3 TM, single track section between Harris and Rivermont near Montview (MP 174.6) on the Alexandira/Montview District which includes 2,464 LF of bridge over the James River and the 1334 LF Rivermont Tunnel.

- *CP Howell* -- A single-track segment between the Greenville-Howell Line and the Howell to Austell Line near Atlanta Ga., where the single main track crosses two CSXT tracks at-grade on a 9-degree curve and the train speed is 15 mph.

- *Cooks Springs Tunnel* -- MP 770.7, on the East End District is 802 LF with two (2) adjacent highway underpasses and represents a single track for 1.2 TM.

- *Warrior Waterways* -- Between MP 225.6 and MP 230.0 (4.4 TM) on the AGS South District, there are four (4) drainage structures totaling 9,515 LF with a single track.

- *Tombigbee Waterways* -- Between MP 245.7 and MP 249.7 (4.0 TM), on the AGS South District, there are six (6) drainage structures totaling 7,788 LF with single track.

- *Pearl River* -- Between MP 159.2 and MP 159.9 (0.7 TM) there is a 3,663 LF bridge with single track on the NO & NE District.

- *Lake Ponchartrain* -- Between MP 172.2 and MP 178.0 (5.8 TM) there is 30,742 LF of single-track bridge on the NO & NE District.

3. Between Lynchburg and Memphis

The estimated costs of improving the NS Line between Lynchburg, VA and Memphis, TN are contained in Attachment C to this Appendix. Attachment C is a summary of the districts, route miles and costs for Columns A, B, and C on the entire line. As shown by Attachment C, the ranges of estimated costs for increasing train speeds and line capacity on the NS Line between Lynchburg and Memphis are:

- Column A: Reduce curvature and increase train speeds: $99.7-$108.8 million
- Column B: Phase I, increase line capacity: $496.2-$541.3 million
- Column C: Phase II, increase line capacity: $1,515.6-$1,653.4 million

Attachments C-1 through C-8 consist of 8 pages with each page representing a district or portion of a district traversed by the route from Lynchburg to Memphis. Each page describes the route miles, current annual million gross tons of traffic over the district, current method of operation, present maximum authorized zone train speeds for passenger, intermodal (Rhwy) and freight trains, and Woodside's recommended improvements and their estimated costs.

There are several locations on the entire route that represent "choke points" that might delay rail traffic. These locations were omitted from Woodside's capacity improvement plans because of their high costs and complexity of construction:

- About 18 RM over the Christiansburg summit between Roanoke and Walton has a ruling grade of 1.34% with a continuous series of 4° to 8° curves and authorized train speeds of 30 to 35 mph. The cost of the realignment of the railroad does not appear to justify the benefits.
- Between Pulaski and Glade Springs on the Walton to Bristol Line where there are three line segments totaling 24 RM where a continuous series of curves ranging up to 7° and rugged terrain results in about 24 RM of 30 mph to 45 mph authorized train speeds. The cost of the realignment of the railroad does not appear to justify the benefits.
- On the line between Bristol and Knoxville, there is 78 RM of curve territory averaging about 2 to 3 curves per mile and ranging from 4° to 6° and authorized train speeds of 35 mph to 45 mph. A major realignment of the railroad does not appear to be practical in this line segment.
- The Holston River Bridge, about 16 miles east of Knoxville is 1,030 LF long and has adjacent highway underpasses. Thus, about 1.0 RM of single track will remain between two segments of double track.
- Near Chattanooga on the line to Memphis there is Lookout Mountain Tunnel (3537 LF), Lookout Creek Bridge (369 LF) and a CSXT railroad under crossing in a distance of about 1.0 RM which remains single track between two line segments of double track.

- Slow train speeds for 13 RM on CSX joint facility trackage, Wauhatchie to Stevenson.

- Single Track for 4.5 RM through Huntsville because of 14 highway overpasses presumed to have insufficient clearances for a second main track.

- Single track for 0.7 RM because of the 1,701 LF Tennessee River Bridge and two highway overpasses at Decatur.

- Single Track for 1.0 RM at Walker (MP 442.4) for the 931 LF Tenn-Tom Waterways.

- Single Track for 0.8 RM at Cypress (MP 417.6) for the 571 LF Cypress Creek Bridge and two other waterways.

- Single Track for 3.0 RM for five (5) bridges totaling 1,349 LF and a highway overpass at Pocahontas (MP 477.5).

- Single Track for 1.0 RM for the 492 LF Wolf River Bridge and two other waterways totaling 303 LF at Moscow (MP 513.5).

- Single Track for 1.5 RM for seven (7) drainage structures totaling 960 LF West of Moscow at MP 518.

4. Assumptions And Basis For Cost Estimates

The cost estimates used to prepare Woodside's estimates have been based on those normally used for Class I railroad construction projects. Although Woodside's cost estimating methodology and unit cost factors are not identical to those used by NS, Woodside's total estimated costs for specific construction projects, when compared to NS's total estimated costs, have been found to be in general agreement. Woodside made assumptions and used the bases for estimating costs that follow:

1. <u>Right of Way</u>: For the most part, the existing right of way is assumed to be about 100 ft. wide. There are exceptions such as the "B" Line between Manassas and Riverton Jct. that appears to be about 60 ft wide. Purchase of additional right of way was included for major line changes to increase train speeds and for second or third main tracks where right of way is known to be narrow. The following is the basis for the cost estimate for the right of way purchases.

    a. Grazing Land $10,000/Acre (AC)

    b. Farm Land $30,000/Acre (AC)

c. Suburban Land $60,000/Acre (AC)

2. Grading: Cost of grading includes cuts and fills as well as select imported earth, clearing, grubbing, erosion control, drain ditches and compaction. Earth barrow on much of the right of way is not available, thus, imported earth must be assumed for additional trackage. Proposed cross sections for a new second or third main track adjacent to an existing main track are based upon 15 ft. track centers and NS's standard main track cross sections. The following is the cost estimate basis for earthwork:

   a. Average Cost per Cubic Yard: $15.00

   b. Light Fill - 1.7 CY/TF

   c. Medium Fill - 2.5 CY/TF

   d. Heavy Fill - 3.0 CY/TF

   e. Very Heavy Fill - 5.0 CY/TF

3. Track

   New Track: New materials include 136 lb premium continuous welded rail (CWR), new tie plates, spikes, field welds, rail anchors all of which is known as Other Track Material (OTM), new main track treated timber crossties, new AREA high speed ballast, and prepared sub-ballast. The unit cost for all trackwork includes all additives commonly used by railroads for recollectible work including purchase expenses and freight for materials and all fringe benefits, pensions, health and welfare, etc. for labor and costs associated with project management. Other costs include flagging and operating expense associated with railroad track and bridge construction work and compliance with FRA Roadway Workplace Safety for bridge and roadway workers. Railroad labor and material costs have been escalated to the year 2002, by use of the Association of American Railroad (AAR) indices for such railroad related costs. All new track construction complies with FRA Part 213, Class 4 track.

   i. New Track -- $150/TF

   ii. New No. 20 Turnout Complete* -- $140,000

   iii. New No. 15 Turnout Complete* -- $120,000

iv. Rehabilitate Existing Siding -- $80/TF

v. Relocate Spur Tracks and Leads -- $100,000 ea.

vi. At-Grade Crossings, both new and -- $700/LF (rehabilitated including new rail, new crossties, perforated pipe drainage, geotextile fabric and concrete panels)

Note: Each turnout consists of a switch section and a frog section and all switch ties and interrelated connections.

4. Signal Work: The estimated cost for signal work includes all additives commonly used by railroads for recollectible work mentioned under trackwork above.

i. Interlock: For the purpose of this study a signal interlock is the power switch machine, signals, communications, electronics, cases, signal houses, connections etc at each power-operated turnout. Each interlock is estimated to cost $550,000.

ii. Intermediate Signals, Coded Track Circuits, Communications: This part of the Train Control System is estimated to cost $200,000 per TM.

iii. Grade Crossing Warning Systems: Automatic grade crossing warning systems can be flashing lights, flashing lights with gates or cantilever signals with flashing lights and gates. For the purpose of this study where a second or third main track is constructed in single track territory, the following will apply:

iv. Estimated Cost

1. Existing flashing lights and gates $100,000 ea; will be adjusted, relocated, etc.

2. Existing flashing lights only and $210,000 ea; public crossings with a passive cross buck warning system will be upgraded to new automatic flashing lights and gates.

3. Electric Locks: Where TC is installed in non-TC territory $100,000 ea. , Electric Locks must be installed on turnouts at spur tracks, storage sidings and other industrial tracks. Generally active yards and industrial tracks will receive new power operated No. 15 turnouts off of main

tracks or controlled sidings where TC is installed in non-block or ABS territory.

4. Rearrange, relocate hotbox, dragging equipment, hot wheel detectors or $100,000 ea.

5. AEI Scanners: Where a second main track is constructed, existing detectors and scanners must be supplemented for the second track.

6. Central Dispatchers Control System: As the new TC territory expands, added communications and electronic control panels must be added to the central dispatchers office. There may be some flexibility in existing systems but $1,000,000 is included for each large district or a combination of smaller districts so that the central dispatching system can be expanded.

5. Bridges, Trestles, Culverts, Highway Underpasses and Highway Overpasses:

   A substantial part of the former Southern Railway, which is now single track, was all double track at one time. Based upon track charts and very limited field experience, the following is concluded:

- Some bridges are still in place but their physical condition is unknown and at the very least, the open deck structures will require new treated bridge ties.
- Some former roadbed exists for hundreds of miles but will require reworking, grubbing, clearing, added fill and sub-ballast.
- Some smaller railroad bridges are currently used for maintenance vehicles.
- Some bridges are missing but the abutments remain in place.
- Some highway underpasses may be able to accommodate a second track but others may have been constructed after the second track was removed and no provision was made for future second track.
- Some highway overpasses may be able to accommodate a new second track but the estimates are made based upon 15 ft track centers and it is not known if there is adequate clearances.

- Some highway overpasses may have been constructed subsequent to the removal of the second main track and provision may not have been made for a future main track.

The bridges and large culverts were divided into three categories for estimating purposes.

a. Timber trestles (WT), concrete arch (CA), concrete box (CB), concrete span (CS), brick arch (BA) and beam steel (BS) with generally short spans -- $6,000 / LF

b. Steel, deck truss (DT) and deck plate (DP), girders with relatively short spans) -- $14,000/ LF

c. Steel, through plate girder (TG) mixed span (MS) and through truss (TT) spans of substantial span length (80 ft. to 250 ft.) -- $20,000 / LF

d. Small culverts not shown on the track chart consisting mainly of small diameter pipes, wooden boxes, masonry boxes, etc. were estimated to be three (3) per TM of new construction at $10,000 each.

e. Highway overpasses where the clear space for tracks is unknown, the estimated cost to widen the overpass is $3.5 million.

f. A highway underpass where the existence of a structure for a second track is unknown, the estimated cost for a new railroad bridge, with piers and abutments, is $2 million.

g. The Norfolk Southern Fiberoptic Map shows that there are existing fiber optic lines on the right of way between Atlanta and Manassas and between Knoxville and Bulls Gap. There are two segments with two fiber optic lines of separate ownership and the balance is a single fiber optic line with single ownership. The location of the fiber optic lines on the right of way was not provided for this estimate and, in fact, the location of proposed trackage relative to the existing main track is uncertain. Thus, it is assumed that existing fiber optic lines must be relocated. The estimated cost to relocate a single fiber optic line is $200,000 per RM.

Attachment A

Summary of Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA and Between Lynchburg, VA and Memphis, TN

Attachment	Between	Route Miles	Column A	Column B	Column C
			Reduce Curvature, Increase Train Speeds	Phase I, Increase Line Capacity	Phase II, Increase Line Capacity
			$ Millions	$ Millions	$ Millions
B	Northern New Jersey Shared Assets Area and New Orleans	1,438.4	$211.1	$927.6	$3,281.2
C	Lynchburg, VA and Memphis, TN	756.8	82.4	410.1	1,252.6
Subtotal		2,195.2	$293.5	$1,337.7	$4,533.8
Engineering & Contingency at 21%			61.6	280.9	952.1
Total at Low E & C			$355.1	$1,618.6	$5,485.9
Engineering & Contingencies at 32%			93.9	428.1	1,450.8
Total at High E & C			$387.4	$1,765.8	$5,984.6

Attachment B

Summary of Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Page of Attachment B	Location	Route Miles	Column A	Column B	Column C
			Reduce Curvature, Increase Train Speeds	Phase I, Increase Line Capacity	Phase II, Increase Line Capacity
			$ Millions	$ Millions	$ Millions
B-1	Manville to Allentown	52.2	$15.1	$30.1	$168.7
B-2	At Allentown	4.4	0.3	11.0	11.0
B-3	Allentown to Near Reading	27.6	4.6	45.6	108.8
B-4	Near Reading to Reading	9.4	7.5	34.4	63.6
B-5	Reading to Harrisburg	50.8	-0-	37.5	229.0
B-6	Harrisburg to Hagerstown	73.7	22.1	54.4	175.1
B-7	Hagerstown to Front Royal	58.3	8.0	63.0	174.2
B-8	Front Royal to Manassas	49.9	18.0	37.6	122.0
B-9	Manassas to Lynchburg	142.0	8.8	68.3	206.0
B-10	Lynchburg to Salisbury	158.7	5.8	59.8	219.1
B-11	Salisbury to Greenville	150.8	1.0	119.4	261.6
B-12	Greenville to Atlanta	150.9	7.1	71.5	159.7
B-13	Atlanta to Austell	15.0	5.5	63.6	105.6
B-14	Austell to Birmingham	141.8	82.0	58.0	379.2
B-15	Birmingham to Meridian	159.7	4.3	43.8	332.5
B-16	Meridian to New Orleans	193.2	21.0	129.6	565.1
Subtotal		1,438.4	$211.1	$927.6	$3,281.2

REEBIE

Page of Attachment B	Location	Route Miles	Column A	Column B	Column C
			Reduce Curvature, Increase Train Speeds	Phase I, Increase Line Capacity	Phase II, Increase Line Capacity
			$ Millions	$ Millions	$ Millions
Engineering & Contingencies at 21%			44.3	194.8	689.1
Total at Low E & C			$255.4	$1,122.4	$3,970.3
Engineering & Contingencies at 32%			67.6	296.8	1,050.0
Total at High E & C			$278.7	$1,224.4	$4,331.2

Attachment C

Summary of Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Lynchburg, VA and Memphis, TN

Page of Attachment C	Location	Route Miles	Column A	Column B	Column C
			Reduce Curvature, Increase Train Speeds	Phase I, Increase Line Capacity	Phase II, Increase Line Capacity
			$ Millions	$ Millions	$ Millions
C-1	Lynchburg Yard	0.4	$-0-	$5.7	$5.7
C-2	Lynchburg to Roanoke	51.4	6.1	20.7	73.3
C-3	Roanoke Yard	---*	0.5	10.5	10.5
C-4	Roanoke to Walton	37.7	5.5	37.1	84.0
C-5	Walton to Bristol	110.7	14.9	35.4	43.9
C-6	Bristol to Knoxville	125.0	12.3	59.1	132.2
C-7	Knoxville to Chattanooga	118.8	17.1	48.1	110.1
C-8	Chattanooga to Memphis	312.8	26.0	193.5	792.9
Subtotal		756.8	$82.4	$410.1	$1,252.6
Engineering & Contingencies at 21%			17.3	86.1	263.0
Total at Low E & C			$99.7	$496.2	$1,515.6
Engineering & Contingencies at 32%			26.4	131.2	400.8
Total at High E & C			$108.8	$541.3	$1,653.4

* The 7.2 RM of trackage in this Roanoke Yard Study is included in the adjacent Districts mileage on this page.

Attachment D

Operating Abbreviations and Definitions

Abbreviation	Full Name	Definition
District	Shown in NS's Timetables:	For the purpose of this Study, a "District" is defined as the title at the top of a page or pages in an NS' Division Timetable that describes all or a portion of a line segment on the Study Route in terms of mileposts, station names and signaled territories. The "District's" Method of Operation, Maximum Authorized Zone Speeds and Speed Restrictions by milepost for turnouts, curves, etc. are also found in the Timetable.
TF	Track Feet:	The length of a single track in feet.
TM	Track Mile:	The length of a single track in miles.
LF	Linear Feet:	The length of a bridge or tunnel in feet.
RM	Route Miles:	The actual miles between two terminals without regard to the length of multiple main tracks.
MP	Mile Post:	The mile number designate by the railroad company for each station, bridge, tunnel, grade separation, etc.
Rhwy	Rail Highway:	Abbreviation for Triple Crown, and TOFC/COFC intermodal trains.
DT	Double Track:	Two main tracks.
ST	Single Track:	One main track with sidings.
NS	No Signals:	Sometimes called dark territory.
ABS	Automatic Block Signals:	
TWC	Track Warrant Control:	Dispatchers issues warrants for movement by trains.
TC	Train Control:	Central dispatcher remotely controls power switches and absolute signals for train movements in both directions.
RC	(Remote Control):	Territory is included under TC in this Study.
YL	Yard Limit:	Yard Speed, Rule 93.
DT ABS	Double Track, Automatic Block Signals:	Indicates uni-directional train movement on each track by block signal indication.
DT ABS TC	Double Track Train Control:	Indicates dispatchers' remote control of bi-directional train movement on each track.

Abbreviation	Full Name	Definition
ST ABS TC	Single Track Train Control:	Indicates a central dispatcher using remotely controlled power switches and signals controls train operations in both directions.
Universal Crossovers		Double crossovers in DT ABS TC territory which provide dispatching flexibility, particularly where both high and low speed trains operate.
Zone Train Speeds	Prevailing Maximum Authorized Train Speeds:	Applies to passenger, intermodal (Rhwy) and freight trains in a given district subject to speed reductions on curves, through turnouts, through city ordinances, etc. Other factors that control train speeds include signal spacing and stopping distance, gradient, train handling and unstable subgrade. Subzone train speeds are long stretches of authorized train speeds within a district.
Annual MGT	Annual Million Gross Tons:	Railroad traffic over a district expressed in millions Gross Tons which is the sum of traffic in both directions.
IMS	Intermodal Services:	Including yard trackage, platforms, IMS cranes, etc., not included in these cost estimates.
FRA	Federal Railroad Administration:	Particular reference to CFR49, Part 200 to 268.

Attachment E

Summary of the Ranges of Estimated Costs By State For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

($ Millions)

State	Location	Route Miles	Column A Ranges To Reduce Curvature, Increase Train Speeds		Column B Phase I, Ranges To Increase Line Capacity		Column C Phase II, Ranges To Increase Line Capacity	
			Low	High	Low	High	Low	High
NJ	Manville to Phillpsburg	40.2	6.9	7.5	29.4	32.1	177.4	193.6
PA	Phillipsburg to Vicinity of Hagerstown MD (Mason-Dixon) via Harrisburg	172.2	53.1	57.9	228.4	249.0	728.5	794.7
MD	Hagerstown to Shepherd	21.4	7.1	7.6	3.9	4.2	29.4	32.1
WV	Shepherd to Rippon/Audley	19.3	---	---	7.3	7.9	43.7	47.7
VA	Rippon/Audley to Stokesland via Riverton Jct., Manassas and Lynchburg	282.5	39.7	43.3	227.5	248.3	665.3	725.7
NC	Stokesland to Grover	177.2	3.1	3.3	53.0	57.8	293.7	320.4
SC	Grover to Tugalo	122.0	6.2	6.8	161.5	176.3	252.2	275.0
GA	Tugalo to Tallapoosa via Howell and Austell	158.9	50.0	54.7	153.3	167.1	364.0	397.1
AL	Tallapoosa to Kewanee via Irondale Jct.	232.8	63.9	69.9	93.7	102.4	679.4	741.2
MS	Kewanee to Nicolson via Meridan	171.8	25.4	27.7	142.8	155.8	654.1	713.5

State	Location	Route Miles	Column A Ranges To Reduce Curvature, Increase Train Speeds		Column B Phase I, Ranges To Increase Line Capacity		Column C Phase II, Ranges To Increase Line Capacity	
			Low	High	Low	High	Low	High
LA	Nicolson to New Orleans	40.1	---	---	21.5	23.5	82.6	90.2
Total, Engineering & Contingency @ 21%		1,438.4	255.4		1,122.4		3,970.3	
Total, Engineering & Contingency @ 32%		1,438.4		278.7		1,224.4		4,331.2

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Attachment F

Summary of the Ranges of Estimated Costs By State For Increasing Train Speeds and Line Capacity on NS Lines

Between Lynchburg, VA and Memphis, TN

($ Millions)

State	Location	Route Miles	Column A Ranges To Reduce Curvature, Increase Train Speeds		Column B Phase I, Ranges To Increase Line Capacity		Column C Phase II, Ranges To Increase Line Capacity	
			Low	High	Low	High	Low	High
VA	Lynchburg to Bristol including improvements to Crosstown Connection, Montview to Kinney, and Roanoke Yard Bypass Track	200.2	32.7	35.7	132.4	144.4	262.9	286.8
TN	Bristol to Memphis via Knoxville, Chattanooga, Wauhatchie, CSX Joint Track to Stevenson, and line segment Wenasoga to Memphis	369.4*	44.0	48.0	222.9	243.1	567.1	618.7
AL	Stevenson to Oldham	153.2	14.3	15.6	121.7	132.8	577.1	629.5
MS	Oldham to Wenasoga	34.0	8.7	9.5	19.2	21.0	108.5	118.4
Total, Engineering & Contingency @ 21%		756.8	99.7		496.2		1,515.6	
Total, Engineering & Contingency @ 32%		756.8		108.8		541.3		1,653.4

*Includes 32.7 RM of CSX Joint Facility Track.

Attachment G

Current and Projected 2020 NS Daily Train VolumesTo Handle High Scenario Diverted Traffic

	Between New Orleans and Northern New Jersey			Between Memphis and Lynchburg			Other
Route Segment	Current Daily Volume Trains	Diverted Volume Trains	Total New Daily Volume Trains	Current Daily Volume Trains	Diverted Volume Trains	Total New Daily Volume Trains	Diverted Volume Trains
Laredo-Houston							6
Houston-New Orleans							20
New Orleans-Meridian	17	30	47				
Dallas-Jackson, MS							8
Jackson-Meridian							12
Meridian-Atlanta	32	42	74				
Atlanta-Greenville, SC	22	60	82				
Greenville-Charlotte	21	62	83				
Charlotte-Greensboro	36	70	106				
Greensboro-Lynchburg	31	76	107				
Memphis-Huntsville, AL				35	8	43	8
Huntsville-Chattanooga				20	14	34	
Chattanooga-Knoxville				34	14	48	
Knoxville-Roanoke				11	22	33	
Roanoke-Lynchburg				27	22	49	
Lynchburg-Manassas	17	98	115				
Manassas-Alexandria							10
Manassas-Harrisburg	22	86	108				
Harrisburg-Philadelphia							18
Harrisburg-Northern New Jersey	25	64	89				

Notes: (1) Assumes that Philadelphia traffic is routed via Harrisburg.

(2) Current train volumes based on 2001 NS Traffic Density, calculated at 3100 gross tons per train.

Attachment B-1

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Manville to Allentown**		
District	Lehigh Line		
Station Limits	Manville (MP 36.4) to CP Bethlehem (MP 88.6)		
Route Miles	52.2		
Annual MGT	29 to 32 (3 miles of 39.4)		
Current Method of Operation	Mostly Single Track TC; 8 RM of DT TC; 7.5 RM DT ABS		
Zone Train Speeds	Freight – 50 with some 40 and 30 mph		
Column	**A**	**B**	**C**
Proposed Construction	Minor and Major Line Changes to Reduce Curvature, Revise Superelevation and Spiral Lengths	Extend one Siding, Construct One New Siding; Upgrade One Siding; Upgrade signals in Siding and Double Track to Rule 261	Double Track Bidirectional TC with Universal Crossovers; Upgrade Siding and Some Double Track to Rule 261 Territory
	$ Millions	$ Millions	$ Millions
Estimated Cost	15.1	30.1	168.7
Notes:	Not practical for line changes MP 77.0 to MP 79.5, now 30 mph with compound curves in double track up to 7 degrees.	Does not include enlarging Pattenburg Tunnel. Harrisburg Timetable #3 shows not to exceed 20'-3" ATR for line clearance.	Does not include enlarging Pattenburg Tunnel. Line clearance is 20"-3" ATR.

Attachment B-2

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	At Allentown		
District	Reading Line		
Station Limits	CP Bethlehem (MP 88.6) to CP Burn (MP 93.00)		
Route Miles	4.4		
Annual MGT	22		
Current Method of Operation	Single Track TC		
Zone Train Speeds	Freight – 30 mph		
Column	A	B	C
Proposed Construction	Realign one 4 Degree Curve to Permit Speed Increase	Construct Double Track Bidirectional TC between Two Similar segments CP Bethlehem to CP Burn	Construct Double Track Bidirectional TC between Two Similar segments CP Bethlehem to CP Burn
	$ Millions	$ Millions	$ Millions
Estimated Cost	0.3	11.0	11.0

Notes:

Attachment B-3

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Allentown to Near Reading**		
District	Reading Line		
Station Limits	CP Burn (MP 35.1) to CP Blandon (MP 7.5)		
Route Miles	27.6		
Annual MGT	65		
Current Method of Operation	Double Track ABS Rule 251		
Zone Train Speeds	Generally 50 mph Freight		
Column	A	B	C
Proposed Construction	Realign or Change Line for 5 curves to increase Train Speed in Double Track	Add Two, 5 TM Sections of Triple Track Bidirectional TC and Upgrade Existing Line to Double Track Rule 261	Three Main Tracks Bidirectional TC with Universal Crossovers and Upgrade DT Rule 251 to Rule 261
	$ Millions	$ Millions	$ Millions
Estimated Cost	4.6	45.6	108.8

Notes:

Attachment B-4

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Near Reading to Reading**		
District	Reading And Harrisburg Lines		
Station Limits	CP Blanton (MP 0.0) to CP Wyomissing Jct. (MP 9.4)		
Route Miles	9.4		
Annual MGT	57-66-75		
Current Method of Operation	Single Track TC and Double Track Rule 261		
Zone Train Speeds	Freight – 30, 40 and 50 mph		
Column	A	B	C
Proposed Construction	Realign Curves by Shifting, Minor and Major Line Changes	Construct 5.2 Miles of Second Main Track to Create 9.4 RM of Double Track Bidirectional TC	Create 5.4 RM of Triple Track CP Blanton to CP Belt and double track CP Tulp to CP Wyomissing Jct.
	$ Millions	$ Millions	$ Millions
Estimated Cost	7.5	34.4	63.6

Attachment B-5

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	Reading to Harrisburg		
District	Harrisburg Line		
Station Limits	Wyomissing Jct. (MP 61.1) to CP Capitol (MP 111.9)		
Route Miles	50.8		
Annual MGT	82 to 89		
Current Method of Operation	All Double Track; 50.8 RM of Bidirectional TC		
Zone Train Speeds	Mostly Freight 50 Mph with 8 RM of 40 Mph		
Column	A	B	C
Proposed Construction	Shift Curves, Minor and Major Line Changes to Increased Train Speeds	Construct Two Sections of Triple Main Track Totaling 9.6 RM with Universal Crossovers	Construct a Third Main Track for 50 RM with Universal Crossovers Every 10 Miles
	$ Millions	$ Millions	$ Millions
Estimated Cost	None	37.5	229.0
Notes:	Curvature is generally 1 to 2 degrees with adequate super- elevation.	No grade separations are included since triple track locations were chosen to minimize structures of all types.	Includes $92 million in highway overpass and underpass separations that may be reduced after on-the-ground inspections.

Attachment B-6

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Harrisburg to Hagerstown**		
District	Lurgan Branch		
Station Limits	CP Capitol (MP 0.0) to CP Ship to CP Town (MP 73.7) = MP. 06, Hagerstown Dist.		
Route Miles	73.7		
Annual MGT	24 to 26		
Current Method of Operation	Mostly Single Track Rule 261 (TC), Some Double Track Rules 251 and 261		
Zone Train Speeds	Freight 50 and 40 mph		
Column	A	B	C
Proposed Construction	Revise Superelevation and Spiral Lengths, Relay 33 TM of Rail. T&S for 35 TM. Upgrade Signals	Extend Three Sidings. Rehabilitate Existing Sidings Upgrade Signal System. Some Rail an T&S Work	Double Track Bidirectional TC with Universal Crossovers, Relay 33 TM of Rail, T&S 35 TM, Upgrade Existing Sidings
	$ Millions	$ Millions	$ Millions
Estimated Cost	22.1 [1]	54.4	175.1

Notes: 1. Curve improvements are $4.5 million.

Attachment B-7

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Hagerstown to Front Royal**		
District	Hagerstown		
Station Limits	Hagerstown (MP 0.6) to Riverton Jct. (MP 58.9)		
Route Miles	58.3		
Annual MGT	24		
Current Method of Operation	Singe Track ABS TC		
Zone Train Speeds	Freight – 50 mph		
Column	A	B	C
Proposed Construction	Revise Superelevation and Spiral Lengths. Also, Minor and Major Line Changes as Required.	Three new Sidings and Extend Three Sidings. Rehabilitate Existing Sidings. Also Construct a 4.5 RM DT Line Change Around Riverton Junction Choke Point.	All Double Track Bidirectional TC with Universal Crossovers and Rehabilitate Existing Sidings and Includes the 4.5 RM DT Line Change at Riverton.
	$ Millions	$ Millions	$ Millions
Estimated Cost	8.0	63.0	174.2
Notes:		The Riverton Jct. line change includes the cost of two highway overpasses and a 800 LF DT steel bridge over Shenandoah River with a total cost of $42.1 million.	

Attachment B-8

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Front Royal to Manssas**		
District	Manassas – Edinburg (“B” Line)		
Station Limits	Riverton Jct. (MP 50.9) to Manassas (MP 1.0)		
Route Miles	49.9		
Annual MGT	12		
Current Method of Operation	No Signals – Single Track TWC		
Zone Train Speeds	Passenger 45, Rhwy 45, Freight 45 Mph		
Column	A	B	C
Proposed Construction	Minor and Major Line Changes to Reduce Curvature Revise Superelevation and Spiral Length	Add Four Sidings, Install Train Control Signals	Double Track Bidirectional TC, Universal Crossovers
	$ Millions	$ Millions	$ Millions
Estimated Cost	18.0	37.6	122.0

Notes:

Attachment B-9

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	Manassas to Lynchburg		
District	Alexandria/ Montview		
Station Limits	Manassas (MP 32.6) to Montview (174.6)		
Route Miles	142.0		
Annual MGT	17		
Current Method of Operation	ABS TC; 76 RM Single Track, 66 RM Double Track		
Zone Train Speeds	Passenger 79, Rhwy 60, Freight 50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	8.8	68.3	206.0
Notes:			Does not include 2.3 TM of single track Harris to Rivermont including James River and Rivermont Tunnel.

Attachment B-10

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Lynchburg to Salisbury**		
District	Montview To Salisbury		
Station Limits	Montview (MP 174.6) to Salisbury (MP 333.3)		
Route Miles	158.7		
Annual MGT	40 Except 58 MGT in vicinity of Salisbury		
Current Method of Operation	ABS TC; 66 TM of Single Track, 92 RM of Double Track		
Zone Train Speeds	Passenger 79, Rhwy 60, Freight 50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	5.8	59.8	219.1
Notes:		Includes $20.5 million for grade separations and $6 million for bridges that could be reduced by on-the-ground inspection.	Includes $74 million for grade separation and $34 million for bridges that could be reduced by on-the-ground inspections. Assumes North Carolina Railroad will construct 8.7 TM of second main track COX to Hoskins in 2004.

Attachment B-11

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Salisbury to Greenville**		
District	Salisbury – Greenville		
Station Limits	Salisbury (MP 333.3) to Greenville (MP 484.1)		
Route Miles	150.8		
Annual MGT	23 to 30		
Current Method of Operation	ABS TC, 66.7 TM Single Track; 84.1 RM Double Track		
Zone Train Speeds	Passenger 79, Rhwy 60, Freight 50		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	1.0	119.4	261.6
Notes:		Includes $37 million in grade separations and $16 million in bridges that could be reduced by on-the-ground inspections.	Includes $71 million in grade separations and $41 million in bridges that could be reduced by on-the-ground inspections.

Attachment B-12

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Greenville to Atlanta**		
District	Greenville – Inman		
Station Limits	Greenville (MP 484.1) to Howell (MP 635.0)		
Route Miles	150.9		
Annual MGT	28 to 34 except 39 Doraville to Birmont		
Current Method of Operation	ABS TC; 61.4 TM of Single and 89.4 RM of Double Track		
Zone Train Speeds	Passenger 79, Rhwy 60, Freight 50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	7.1	71.5	159.7

Notes:

Attachment B-13

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Atlanta to Austell**		
District	Atlanta North And Atlanta South		
Station Limits	Howell (MP 149.7) to Austell (MP 134.7)		
Route Miles	15.0		
Annual MGT	100		
Current Method of Operation	Austell-Bolton DT-ABS-TC; Bolton-Howell ST-ABS-RC/TC		
Zone Train Speeds	Passenger 79, Rhwy 60, Freight 50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	5.5	63.6	105.6
Notes:		Includes a double track connection from the Alabama Division at Austell.	Includes upgrading Bolton to Howell from single track ABS RC to double track bidirectional TC and a 1,325 ft. steel bridge.

Attachment B-14

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Austell to Birmingham**		
District	East End District		
Station Limits	Austell (MP 650.0) to Irondale Jct. (MP 791.8)		
Route Miles	141.8		
Annual MGT	31 to 34		
Current Method of Operation	ST, TC (138.8 RM); DT TC (3.0 RM)		
Zone Train Speeds	Passenger 79, Rhwy 60, Freight 50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	82.0	58.0	379.2
Notes:	Viability of some line changes contingent on field review. The 79/60/50 mph zone speed can be attained in only about 50% of the district.	Maximizing dispatching flexibility with line segments of minimum bridge and grade separation costs.	The 802 ft. long Cook Springs Tunnel and adjacent underpasses remain single track (1.2 TM). Includes $56 million in grade separations and $74 million in bridgework that could be reduced by field inspections.

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Attachment B-15

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Birmingham to Meridian**		
District	AGS South		
Station Limits	Irondale Jct. (MP 135.7 = 791.8, East End District) to Meridian (MP 295.4)		
Route Miles	159.7		
Annual MGT	39 Except 20 RM of 51 MGT Irondale Jct. to Burstall		
Current Method of Operation	ST, TC (136.7 RM); DT ABS (14.8 RM); DT TC (7.8 RM)		
Zone Train Speeds	Passenger 79, Rhwy 60, Freight 50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	4.3	43.8	332.5
Notes:			Warrior River Waterways (4.4 TM) and Tombigbee Waterways (4.0 TM) remain single track.

Attachment B-16

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Northern New Jersey Shared Assets Area and New Orleans, LA

Location	**Meridian to New Orleans**		
District	N O & N E		
Station Limits	Meridian (MP 0.4 = 295.4, Birmingham South) to NE Tower (MP 193.6)		
Route Miles	193.2		
Annual MGT	18 to 24		
Current Method of Operation	ST, ABS, TWC (181.5 RM); DT, ABS, TWC (11.7 RM)		
Zone Train Speeds	Passenger 79, Rhwy 60, Freight 50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	21.0	129.6	565.1

Notes: No estimate made for New Orleans; Oliver Yard

(MP 195.6)

Pearl River (0.7 TM) and Lake Ponchartrain (5.8 TM) remain single track in future plans. Estimate includes $68.5 million in highway underpass and overpass changes that could be reduced following field inspection. Total railroad bridgework is estimated at $146.7 million which could be reduced by creating additional line segments of single track.

Attachment C-1

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Lynchburg, VA and Memphis, TN

Location	**Lynchburg Yard**		
District	Cross Town Connection Montview To Kinney Yard		
Station Limits	Montview (MP 174.5) to Kinney (MP PH 16.3)		
Route Miles	0.4		
Annual MGT	NA		
Current Method of Operation	YL		
Zone Train Speeds	Yard Speed Rule 93		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	---	5.7	5.7
Notes:		This short interdivisional connection represents a “choke point,” creating train delays.	This short interdivisional connection represents a “choke point,” creating train delays.

Attachment C-2

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Lynchburg, VA and Memphis, TN

Location	Lynchburg to Roanoke		
District	Crewe To Roanoke Westward		
Station Limits	Kinney (PH 16.3) to Forest (PH 22.4 = N 214.5) to Roanoke (MPN 259.8)		
Route Miles	51.4		
Annual MGT	29		
Current Method of Operation	ST ABS TC (32.5 RM); DT ABS TC (18.9 RM)		
Zone Train Speeds	Rhwy 60 and Freight 50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	6.1	20.7	73.3
Notes:			Universal crossovers every 10 miles. See Page 3 for a separate estimate for a dedicated main track around Roanoke Yard.

Attachment C-3

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Lynchburg, VA and Memphis, TN

Location	**Roanoke Yard**		
District	Roanoke Yard		
Station Limits	MP 255.6 to MP 262.8*		
Route Miles	7.2*		
Annual MGT	54		
Current Method of Operation	Part DT ABS TC, Part ST ABC TC		
Zone Train Speeds	Rhwy 60, Freight 50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	0.5	10.5	10.5
Notes: * This 7.2 RM segment is included partly in the Crewe to Roanoke and partly in the Roanoke Bluefield Districts. The 7.2 RM under study here will not be duplicated in the total mileage under study.		Designed to pass expedited trains around Roanoke Yard, increase authorized train speeds and expedite freight train movements in and out of the yard to increase line capacity.	Designed to pass expedited trains around Roanoke Yard, increase authorized train speeds and expedite freight train movements in and out of the yard to increase line capacity.

Attachment C-4

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Lynchburg, VA and Memphis, TN

Location	Roanoke to Walton		
District	Roanoke To Bluefield – Westward		
Station Limits	Roanoke (MP 259.8) to Walton (MP 297.5)		
Route Miles	37.7		
Annual MGT	54		
Current Method of Operation	ST ABS TC (3.1 RM); DT ABS TC (34.6 RM)		
Zone Train Speeds (Subzone Speeds)	Freight: 10.5 RM-30 Mph, 8.0 RM-35Mph, 3.0 RM-40 Mph, 2.8 RM-45 Mph, 13.0 RM-50 MPH		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	5.5	37.1	84.0
Notes: Mountainous territory and ruling grade westward of 1.34% and eastward of 0.97% limits benefits from curvature reductions.	There are 25 RM of compound curves with, limited reversing tangents, ranging from 4° to 8° Mountainous terrain suggest that the cost of line changes to reduce curvature are not justified.	Includes crossovers between main tracks at each end of third main track and enlarging the Montgomery Tunnel on main track No. 1 for Rhwy trains.	Includes enlarging the Montgomery Tunnel on main track No. 1, for Rhwy trains, Tunnel on main track No. 2 is adequate. Universal crossovers at MP 284.6 and MP 290.5.

Attachment C-5

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Lynchburg, VA and Memphis, TN

Location	**Walton to Bristol**		
District	Walton-Bristol Westward		
Station Limits	Walton (MP 297.6) to Bristol (MP 408.3)		
Route Miles	110.7		
Annual MGT	15		
Current Method of Operation	ST ABS TC (107.5 RM); DT ABS TC (3.2 RM)		
Zone Train Speeds (Subzone Speeds)*	All Trains: 1.3 RM-20 Mph; 7.0 RM-30 Mph; 8.5 RM-35 Mph; 29.6 RM-40 Mph; 42.0 RM-45 Mph; 22 RM-50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	14.9	35.4	43.9

Notes: * Timetable indicates limited subzones of maximum train speeds for Rhwy as follows:

MP	to MP	Frt.	Rhwy
381.2	387.8	50	55
387.7	396.7	50	60
396.7	402.7	50	60

All other zone train speeds are 45 mph or less.

Physical conditions, gradient and curvature make line changes and curvature reductions impractical as follows:

- MP 316 to MP 328 (12 RM)
- MP 364 to MP 371 (7 RM)
- MP 375 to MP 380 (5 RM)

Attachment C-6

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Lynchburg, VA and Memphis, TN

Location	**Bristol to Knoxville**		
District	Knoxville District Bristol Line Westward		
Station Limits	Bristol (MP 0.0=NB 408.3) to W. End Sevier Yard (MP 125.0)		
Route Miles	125.0		
Annual MGT	75 RM, 14 to 16 MGT; 16 RM, 45 MGT; 33 RM, 55 MGT; 1 RM, 67 MGT		
Current Method of Operation	ST ABS TWC – 56 RM; ST ABS TC-48.0 RM; DT ABS TC – 21.0 RM		
Zone Train Speeds	Rhwy-60 Mph; Freight 50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	12.3	59.1	132.2

Notes: The 56 RM of ST ABS TWC represents three stretches of single track located between dispatcher remotely controlled 10,000 ft. long sidings, thus this line segment has a higher capacity than indicated by the current Method of Operation.

Proposed line changes and curve shifting above are located in about 47 RM of the District. About 78 RM averages 2 to 3 curves per mile with 35 mph to 45 mph speed restrictions and curves ranging from 4° to 6° that suggests that a major realignment may not be practical.

The Holston River bridge (1,030 LF) remains single track. The estimate includes $8 million for highway underpasses and $14 million for highway overpass widening that may be reduced following field inspections.

Attachment C-7

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Lynchburg, VA and Memphis, TN

Location	**Knoxville to Chattanooga**		
District	Knoxville West End District-Westward		
Station Limits	W. End Sevier Yard (MP 125.0A) to Chattanooga (MP 243.8A)*		
Route Miles	118.8		
Annual MGT	13.9 RM, 25 MGT; 87.7 RM, 42 MGT; 11.5 RM, 85 MGT; 5.7 RM, 141 MGT		
Current Method of Operation	DT ABS TWC 7.2 RM, ST ABS TWC 79 RM; ST ABS TC-16.5 RM; DT ABS TC 15.8 RM		
Zone Train Speeds	Passenger 60, Rhwy, 60 and Freight 50 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	17.1	48.1	110.1

Notes: * There is a 94.4 RM equation on this route near Chattanooga where the actual Mile Post is 338.2=243.8A.

Attachment C-8

Estimated Costs For Increasing Train Speeds and Line Capacity on NS Lines

Between Lynchburg, VA and Memphis, TN

Location	**Chattanooga to Memphis**		
District	Memphis District East End; Memphis District West End		
Station Limits	Chattanooga, TN to Memphis TN (Includes 32.7 RM, Joint Facility with CSX)		
Route Miles*	312.8		
Annual MGT*	31 to 44		
Current Method of Operation	ST ABS TWC-251.0 RM; ST ABS TC-26.5 RM; DT ABS TC-23.4 RM; DT ABS Rule 251-4.7 RM; YL NS-7.2 RM		
Zone Train Speeds	NS: Rhwy 60, Freight 50 Mph; CSX: Wauhatchie to Stevenson, 60 Mph		
Column	A	B	C
	$ Millions	$ Millions	$ Millions
Estimated Cost	26.0	193.5	792.9

Notes:*	RM	Annual MGT
Chattanooga-Wauhatchie	5.3	43.6
Wauhatchie-Stevenson	32.7	43.4
Stevenson-Norala (Sheffield)	124.1	31
Norala – Robbins	2	40.1
Robbins-Tuscumbia	3.3	40.1
Tuscumbia-Memphis	145.4	36.0-40.0
	312.8	

Column B: Capacity improvements anticipate new coal train movements beginning in 2004, and increase Rhwy traffic as forecasted.

Column C: Choke points of single track or speed restrictions will remain at Lookout Mountain Tunnel (1.0 RM), CSX Joint Track (13.0 RM), 7 Bridges and waterways totaling 8.8 RM and 4.5 RM thru Huntsville with Highway Overpasses. Estimate above contains $105 million for widening highway overpasses and underpasses that could be reduced by field inspections.

THE NORTHEAST – SOUTHEAST – MIDWEST CORRIDOR MARKETING STUDY

APPENDIX 8

Estimated Costs for Additional Terminal Capacity Between Laredo, TX and Northern New Jersey and Between Memphis, TN and Lynchburg, VA

1. Summary

As shown by Attachment A to this Appendix, the estimated costs at year 2002 levels for providing the additional terminal capacity to handle the projected traffic diversions, both on NS's Piedmont Route and its connections between Laredo, TX and the Northern New Jersey Shared Assets Area and on NS's Shenandoah Route between Memphis, TN and Lynchburg, VA are:

- Phase I: $338.5 million
- Phase II: $506.9 million

These cost estimates for the partial build-out in Phase I and for the full build-out in Phase II are independent and are not, therefore, additive. These costs do include engineering and contingencies at 32%, but they do not include costs of new highway interchanges or bridges, if any.

These cost estimates for additional Expressway-type terminal capacity were developed by NS, with minor modifications made by Woodside. However, Woodside has reviewed all of NS's started terminal requirements and cost estimates, and it is our opinion that they are reasonable.

Because the traffic projected to be diverted to NS's Piedmont Route and NS's Shenandoah Route would both use terminal capacity in Alexandria, VA, Rutherford and Morrisville, PA and in Northern New Jersey, we have not separated the estimated costs of the additional terminal capacity between those two NS routes.

2. Basis For The Cost Estimates

The primary basis for the estimates was the size terminal required to handle the diverted traffic in Phase I and Phase II. Terminal locations were first categorized as small, medium, or large, based on the projected volume of traffic to be handled.

The area to be covered by each terminal was estimated based on the length of loading, unloading, and lead tracks, parking, and miscellaneous requirements, including gate areas and buildings. The costs of constructing the required terminal capacity were then estimated using NS unit costs, of which the most expensive components were loading, unloading and lead tracks, turnouts, paving, grading, drainage. In total, NS estimated the costs of a small Expressway-type terminal covering 50 acres at $10.7 million, excluding land costs that were expected to vary by specific location.

In Phase II, medium terminals were projected to be approximately double the size of small terminals and were capable of handling two trains at once. The large terminal projected in North Jersey is projected to be eight times the size of the small terminals, and capable of handling eight trains simultaneously.

Real estate costs per acre were based on costs by type of location as follows:

- Urban at $110,000 per acre
- Suburban at $60,000 per acre
- Farm at $30,000 per acre

Each of the terminals shown in Attachment A was categorized as urban, suburban, or farm, and the appropriate cost per acre was then applied based on 50 acres per terminal for small terminals, 90 acres for medium terminals and 300 acres for the large terminal in North Jersey.

Attachment A

Estimated Costs For Additional Terminal Capacity Between Laredo, TX and Northern New Jersey and Between Memphis, TN and Lynchburg, VA

Terminal	State	Size	Phase I $Millions	Phase II $ Millions
Laredo	TX	Small	$21.5	$21.5
Houston	TX	Medium	18.1	35.4
Dallas	TX	Small	18.1	18.1
Subtotal	TX		$57.7	$75.0
Jackson	MS	Small	16.1	16.1
New Orleans	LA	Small	18.1	18.1
Atlanta	GA	Medium	21.4	41.3
Greenville	SC	Small	18.1	18.1
Charlotte	NC	Small	18.1	18.1
Greensboro	NC	Small	18.1	18.1
Subtotal	NC		$36.2	$36.2
Huntsville	AL	Small	16.1	16.1
Memphis	TN	Small	18.1	18.1
Knoxville	TN	Small	18.1	18.1
Subtotal	TN		$36.2	$36.2
Roanoke	VA	Small	18.1	18.1
Alexandria	VA	Small	21.5	21.5
Subtotal	VA		$39.6	$39.6
Rutherford	PA	Small	18.1	18.1
Morrisville	PA	Medium	18.1	35.4
Subtotal	PA		$36.2	$53.5
North Jersey	NJ	Large	42.8	$156.7
Total			$338.5	$506.9

THE NORTHEAST – SOUTHEAST – MIDWEST CORRIDOR MARKETING STUDY

APPENDIX 9

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The Intermodal Freight Visual Database

Building from TRANSEARCH, the national database of freight traffic flows that Reebie Associates created and has maintained and provided to the transportation industry for 18 years and drawing on its experience with custom database development, the team researched information needs and data sources in the government and commercial markets and the capabilities of state-of-the-art software. The results of the effort have been to make available a national county-to-county and zip code-to-zip code data product. Key user needs like currency of the data, its reliability, flexibility in terms of seeing details of the traffic composition or relatively broad data summaries, and affordability can be satisfied.

Issued annually, the data can cover all modes and commodities, including empty truck movements, international shipping, and truck shipments of non-manufactured goods. Features like external trip ends, vehicle miles traveled, gross ton-miles, and forecasts can be provided, and traffic routed along major modal corridors can be displayed.

The database maps commodity flows (2, 3 and 4 digit STCC) in short tons between geographic entities (states, counties, BEA's) by mode (rail car, rail intermodal, truck load, less than truck load, private truck, air and water) for current year and forecast years. All volumes shown in tons are in short tons, for 2000.

A variety of data sources are used to compile the database ranging from government agencies to private sector industry associations and the carriers themselves, as shown in Figure A9.1.

The data sources vary by the different modes of transportation. The primary source for railroad data is the Carload Waybill Samples gathered from about 4% of total rail car traffic. Reebie Associates sources this data from the Surface Transportation Board. This data is compiled to provide both volumes and patterns of flow.

The primary source for waterborne commodity flows is the Waterborne Commerce Statistics compiled by the Army Corps of Engineers. This data tracks the flow of commodities along domestic lakes, rivers and canals, and is used to develop both volumes and patterns of flow.

INTERMODAL FREIGHT VISUAL DATABASE DATA SOURCES

Mode	Data Source	Agency/Organization
Rail	• Carload Waybill Sample	• Surface Transportation Board
Water	• Waterborne Commerce Statistics	• U.S. Army Corps of Engineers
Air	• FAA Airport Originating Tonnages • Airport to Airport Flows • Commodity Flow Survey • TRANSEARCH	• Office of Airline Statistics (DOT Form 41) • BTS Office of Airline Information • Bureau of Transportation Statistics • Reebie Associates
Truck	• Carrier Data Exchange Program • TRANSEARCH • Annual Survey of Manufactures • Freight Locater Data Service • General Statistics for Verification • Commodity Flow Survey	• Reebie Associates • Reebie Associates • U.S. Census Bureau • Reebie Associates • Industry Associations • Bureau of Transportation Statistics

Figure A9.1

The air data is compiled from four major sources. The first is FAA (Federal Aviation Administration) airport originating tonnages primarily from Form 41 reports and compiled by the Office of Airline Statistics (Federal). This source establishes volume estimates at airports. The second source is airport-to-airport (ATA) flows compiled by the BTS Office of Airline information. These data are used to establish flow patterns. The third source is from Commodity Flow Survey (CFS) data, used to define the commodity types. The fourth source is Reebie Associates' TRANSEARCH Database, which supplements the CFS data.

The trucking data process is more complex and comes from a wide variety of sources developed over the course of 20 years. However, there are four primary sources. The first is a data exchange program Reebie has with motor carriers, which is used to estimate patterns and volumes. The second source is a variety of industry associations (timber, plastics, chemical, automotive, etc.), which provide overall volume information for the respective industry sectors. The third major source is from the Annual Survey of Manufactures, primary employment and output data by industry, distributed at the state and local level. This data maps production and consumption of commodities and is used to calibrate the trucking flows. The Freight Locater data service is a database of industrial facilities and their exact location. This data supplements the previously mentioned sources to help calibrate the flows of goods between specific geographic entities.

IFVDb Data Issues and Limitations – Reebie Associates recently developed a finer detailed version of its TRANSEARCH database in an FHWA sponsored project known as the Intermodal Freight Visual Database. It breaks down origin and destination market areas to the county level and is compatible with GIS applications. It has been incorporated into TRANSEARCH, with its most current base year as 2002. This database (a version developed especially for this project based on VDOT's 1998 data indexed to 2001) is the primary source for the I-81 Corridor Marketing Study.

For this study, TRANSEARCH data were identified at varying levels of detail. It is generally understood that large databases of this kind are never perfect, and TRANSEARCH is not an exception to the rule. It is, however, the best available source of its kind in the cognizance of the study team. TRANSEARCH is in use by virtually all major U.S. railroads and by more than a hundred motor carrier companies and several container shipping lines and air cargo carriers. State and federal planning agencies, as well as port authorities, equipment suppliers, investment banks and judicial and regulatory bodies also use it.

TRANSEARCH reports provide a broad picture of freight traffic movements in the United States. Various publicly available sources, as well as Reebie's proprietary motor carrier data exchange information, are used in the development of the TRANSEARCH database. Understanding the nature of particular sources when using TRANSEARCH data is important to interpret the information correctly. The following guidelines should be helpful in gaining that understanding.

Freight Rehandled By Truck From Warehouse and Distribution Centers Is Identified as STCC 5010 and Referred to as Secondary Traffic at a 4-digit STCC level or STCC 50 at a 2-digit STCC level. Many of these types of facilities handle a wide range of different types of commodities, and outbound shipments may also be of mixed consists. For example, shipments from a supermarket chain distribution center are likely to contain a broad range of packaged food products and other consumer items.

The Truck Portion of Truck/Rail Intermodal Activity Is Shown as STCC 5020 at a 4-digit STCC level or STCC 50 at a 2-digit STCC level. This activity includes two segments: the truck shipment, by trailer or container, from true origin to the intermodal railhead, and from the intermodal railhead to final destination. The Rail Intermodal mode reveals the origin and destination points on the rail system, not the ultimate origin and destination.

STCC 5030 Is Used to Identify the Truck Drayage of Air Freight Traffic 5020 at a 4-digit STCC level or STCC 50 at a 2-digit STCC level. Both the true origin to airport, and airport to final destination are included. Origins and destination for movements classified in the air mode are airports. Volumes that are transloaded from one aircraft to another are not shown at the transloading point.

Large Portions of Today's Intermodal (TOFC or COFC) Traffic Are Reported In Non-Commodity Categories. Commercial arrangements in the railroad industry have fostered the use of "third parties" such as consolidators and forwarders. Such traffic typically is labeled as "Freight Forwarder Traffic", "FAK" (Freight: All Kinds), or "Miscellaneous Mixed Shipments". The specific commodities moving under these arrangements are not identified in the public use data sources.

Shipments Made Up Of Several Commodities Will Be Credited To The Dominant Commodity. This occasionally occurs in the commodity identification of rail shipments. In these instances, the tonnage attributed to the predominant commodity is greater than it should be, and the other commodities in the shipment are understated.

To Provide Maximum Product Identification, Commodities Are Shown At the Greatest Level of STCC Detail For Each Code. Truck data is available and shown at the 4-digit level for the manufacturing sector. Rail data, however, can be shown at 5-digits. Because of the desire to include the greatest amount of detail possible, commodities in a traffic lane may be identified at different levels of detail for each mode. When this occurs, tonnages shown at the more detailed levels should be combined with those displayed at the more aggregate levels to gain a complete picture of modal share for the commodity. All freight traffic flow information in the study is expressed at the 4-digit STCC commodity code level, or consolidated to a 2-digit, or no commodity detail level.

Tonnage Data In Each Cell Should Be Used As An Indicator Of Relative Value—since many of the sources for traffic flow information use sample data. Consequently, the more specific the definition of a particular flow, the greater its sampling variability. The more aggregated the definition of the Geography/Mode/ Commodity combination, the more reliable the results.

State-To-State Movements Of "Primary" Freight At The 2-Digit STCC (or SIC) Level Provide The Best Picture Of Primary Freight Moves In The Data Base. Analysts and planners, however, want and need more disaggregate pictures of the flow activity. Not all of the data used in TRANSEARCH comes into the process beneath the state level or with more than 2-digit commodity/industry classification.